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FACTORS AFFECTING THE EXPORT OF HIGH-SULFUR COAL FROM THE EASTERN INTERIOR BASIN

COMPLETED
254

HEARING

BEFORE THE

SUBCOMMITTEE ON
ENERGY, NUCLEAR PROLIFERATION, AND
GOVERNMENT PROCESSES

OF THE

COMMITTEE ON
GOVERNMENTAL AFFAIRS
UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

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CONTENTS

Opening statement: Page
Senator Percy — 1

WITNESSES

June 8, 1981

Ulf Lantzke, director, International Energy Agency — 4
David Lan Cheng, vice president, Taiwan Power Co., and K. S. Chang, administrator of public affairs, Republic of China; German Hernandoz Dominquez, industry and energy attaché, Spanish Embassy, Washington, D.C.; Bong Suh Lee, assistant minister, Administration of Energy and Resources, Republic of Korea; Willem G. M. Daniels, director, North American Delegate, ATIC, and Jean Faucounau, Charbonnages De France, France; and Akiro Kinoshita, deputy director, Fuel Department, Electric Power Development Co., Japan — 13
Carl Bagge, president, National Coal Association; John Banovic, president-elect, Illinois United Mine Workers of America; Ramesh Malhotra, assistant vice-president for marketing, Freeman United Coal Co.; Wayne Ewing, president, Peabody Coal Co.; J. Harley Williams, vice-president, Old Ben Coal Co.; Michael Reilly, president, Zeigler Coal Co.; Richard Miller, president, Marine Coal Sales; Alan Cope, assistant vice-president of Marketing, Consolidation Coal Co.; and Robert Holloway, assistant to the president, Arch Minerals — 53
Harry J. Bruce, senior vice president for marketing, Illinois Central Gulf Industries; Herbert R. Haar, Jr., associate port director, Port of New Orleans; and John C. Marlin, director, Central States Resource Center — 75
Donald V. Earnshaw, Deputy Assistant Secretary for Export Development, U.S. Department of Commerce; William W. Mason, president, Coal Exporters Association of the United States; Robert Parks, president, E.E.I., Inc.; Roger LeGassie, Acting Assistant Secretary for Fossil Energy, Department of Energy; Arthur F. Nicholson, commissioner, Bureau of Production and Utilization, Kentucky Department of Energy — 110
Peter Borré, Acting Assistant Secretary for International Affairs of the U.S. Department of Energy; George Ecklund, vice president, Zinder-Neris, Inc.; John Ferriter, U.S. Department of State; Zachariah Allen, senior vice president, F. R. Schwab & Associates, Inc.; Thomas Trumpy, European director of Project Assistance International; and Edward J. Bentz, Jr., president, E. J. Bentz & Associates — 141

Alphabetical List of Witnesses

Allen, Zachariah:
  Testimony — 141
  Prepared statement — 216
Bagge, Carl:
  Testimony — 53
  Prepared statement — 63
Banovic, John:
  Testimony — 53
  Prepared statement — 65
Bentz, Edward J., Jr.:
  Testimony — 141
  Prepared statement — 223

ALPHABETICAL LIST OF WITNESSES—Continued

	Page
Boiré, Peter:	
Testimony	141
Prepared statement	154
Responses to written questions submitted by Senator Percy	157
Bruce, Harry J.:	
Testimony	75
Prepared statement	83
Responses to written questions submitted by Senator Percy	87
Chang, K. S.:	
Testimony	13
Prepared statement	25
Responses to written questions submitted by Senator Percy	30
Cheng, David Lan: Testimony	13
Cope, Alan:	
Testimony	53
Prepared statement	72
Responses to written questions submitted by Senator Percy	74
Daniels, Willem G. M.:	
Testimony	13
Prepared statement	38
Dominquez, German Hernandoz:	
Testimony	13
Prepared statement of José Sierra Lopez, president, Carboex	31
Responses to written questions submitted by Senator Percy	35
Earnshaw, Donald V.:	
Testimony	110
Prepared statement	117
Responses to written questions submitted by Senator Percy	119
Ecklund, George:	
Testimony	141
Prepared statement of Norman G. Wilson-Smith, president, Zinder-Neris, Inc	159
Responses to written questions submitted by Senator Percy	162
Ewing, Wayne:	
Testimony	53
Prepared statement	68
Responses to written questions submitted by Senator Percy	69
Faucounau, Jean:	
Testimony	13
Prepared statement with an attachment	39
Ferriter, John:	
Testimony	141
Prepared statement	163
Responses to written questions submitted by Senator Percy	165
"Coal in the Third World: Prospects for Production, Use and Imports from the United States," study	171
Haar, Herbert R., Jr.:	
Testimony	75
Prepared statement with attachments	89
Responses to written questions submitted by Senator Percy	103
Holloway, Robert: Testimony	53
Kinoshita, Akiro:	
Testimony	13
Prepared statement	49
Responses to written questions submitted by Senator Percy	51
Lantzke, Ulf:	
Testimony	4
Prepared statement	8
Responses to written questions submitted by Senator Percy	10
Lee, Bong Suh:	
Testimony	13
Prepared statement	36
Responses to written questions submitted by Senator Percy	37
LeGassie, Roger:	
Testimony	110
Prepared statement	126
Responses to written questions submitted by Senator Percy	131

ALPHABETICAL LIST OF WITNESSES—Continued

Page

- Malhotra, Ramesh:
  - Testimony 53
  - Prepared statement 67
- Marlin, John C.:
  - Testimony 75
  - Prepared statement 104
  - Responses to written questions submitted by Senator Percy 106
- Mason, William:
  - Testimony 110
  - Prepared statement with attachment 120
- Miller, Richard:
  - Testimony 53
  - Responses to written questions submitted by Senator Percy 74
- Nicholson, Arthur F.:
  - Testimony 110
  - Prepared statement 135
  - Responses to written questions submitted by Senator Percy 141
- Parks, Robert:
  - Testimony 110
  - Responses to written questions submitted by Senator Percy 120
- Reilly, Michael: Testimony 53
- Trumpy, Thomas:
  - Testimony 141
  - Prepared statement with attachment 217
  - Responses to written questions submitted by Senator Percy 222
- Williams, J. Harley:
  - Testimony 53
  - Prepared statement 70

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

- Statement of Leonard Gardner, Illinois Farm Bureau 108
- Letter to Senator Percy from James A. Clum and Wesley W. Weidemann, with an attachment titled, "Production of Fertilizer From Flue Gas Desulphurizer" 229
- "The Heterogenous Reactor and the Pircon-Peck Process: The Profitable Answers to High Sulfur Coal Utilization" 235

FACTORS AFFECTING THE EXPORT OF HIGH-SULFUR COAL FROM THE EASTERN INTERIOR BASIN

MONDAY, JUNE 8, 1981

U.S. SENATE,
SUBCOMMITTEE ON ENERGY, NUCLEAR PROLIFERATION, AND GOVERNMENT PROCESSES,
COMMITTEE ON GOVERNMENTAL AFFAIRS,
Carbondale, Ill.

The subcommittee met at 8 a.m., in Ballroom B, Student Center, Southern Illinois University, Hon. Charles H. Percy (chairman of the subcommittee) presiding.

Present: Senator Percy and Congressman Paul Simon.

OPENING STATEMENT OF SENATOR PERCY

Senator PERCY. Good morning, and it is a beautiful morning. I would like to express appreciation to National Public Radio for carrying the entire proceedings today on the local affiliate, WSIV, and on many other affiliates in the area. NPR is making a recording of today's hearing available to other stations as well, for broadcast at a later time.

This morning, the U.S. Senate Governmental Affairs Subcommittee on Energy, Nuclear Proliferation, and Government Processes conducts a field hearing here in Carbondale, Ill., to examine the potential for exporting high-sulfur coal from the Illinois Basin to nations throughout the world. Today's hearing is to be followed this afternoon and all day tomorrow by a conference, which will explore this issue in even more detail.

Right at the start, I want to extend my sincere thanks to the fine people of Southern Illinois University and throughout the State, who have worked for nearly half a year to make this event a success. I especially want to thank Dr. Lyle Sendlein, Michael Crow, Timothy Crawford, and Charles Pizer of the Southern Illinois University Coal Extraction and Utilization Research Center and the members of the Conference Planning Committee for their help. I want to extend my thanks, too, to the president of the Southern Illinois University, Dr. Albert Somit, who has been so very gracious and thoughtful since my arrival.

Field hearings of this kind are a bit unusual for the U.S. Senate, but I find them to be an effective way of insuring that the major issues of today are discussed in the presence of the citizens who are ultimately affected by decisions made back in Washington. This is the third field hearing I have held in the past year in Illinois, and I've scheduled two more on regulatory reform for Quincy and Peoria on July 1 and 2.

Today's hearing is well timed, to say the least. Officials for the United Mine Workers and the bituminous coal operators recently reached agreement on a new contract, on Saturday the rank and file ratified this contract. Coal miners across the Nation are back at work this morning, producing energy for the Nation and the world. There is no better time than now to make high-sulfur coal exports one of the coal industry's highest priorities.

I would like to draw attention at this time to a lump of Illinois coal here on the table and also to a symbolic statue of a coal miner which is crafted from coal. I shall keep this statue in my office in Washington, D.C., as a reminder of the day we are now sharing together here.

It is said repeatedly, and it is true: the world has completed an era in its energy history. No longer satisfied with relying on oil for most of their energy supplies, nations throughout the world are now aggressively pursuing new energy strategies to carry themselves through the 1980's and beyond. Any nation, and I should add any company, with abundant coal reserves available for long-term contract commitments will find an immediate and serious interest among foreign buyers.

With 437 billion tons of demonstrated coal reserves, nearly one-third of the world total, the United States should be expected to profit mightily from the new-found international interest in steam coal. But last year, real doubt began to emerge among foreign buyers about whether the United States, despite its large reserves, could be trusted as a reliable energy supplier. Storage terminals built to accommodate smaller shipments of metallurgical coal were unable to accept steam coal deliveries in the amount required.

Last year, foreign coal importers which contracted to receive American steam coal were forced to wait as long as 100 days for delivery. Railways and shallow ports were equally ill-prepared for the challenge. Ironically, the Soviet Union, with its large reserves of natural gas, is now seen by some Western nations as a more reliable supplier of energy than the United States.

Unless we send a strong signal now to the foreign coal buyers, telling them we have goods to sell and can be counted on to honor long-term contracts, we are going to lose international business to the Soviet Union and other exporting nations that have the resolve to act.

I should note for the record, also, that in an informal session last night, the chief executive officer and presidents of our Illinois coal companies met with the representatives of five foreign nations here and explored a great many ways in which we can work together on this issue.

I'd like to quote from a Congressional Research Service study, prepared especially for this hearing at my request by Duane Thompson and the Environment and National Resources staff of the CRS. This report has just been released today. "The cheapest, quickest, and most fundamental approach to increasing the production of high sulfur coal is through promotion." The Congressional Research Service Study came to that conclusion, and that was a conclusion we reached last night. We have a product. Now we need to get out the word as to its availability. Promotion—that's the word we are going to hear a great deal today. As a former businessman, I could not agree with this recommendation more strongly. Let's tell the world our coal is immediately accessible to the Mississippi River; it has a network of railways with good roadbeds. It can be shipped with far less waiting time than much of the coal along the East Coast.

Certainly, Illinois Basin coal cannot meet the needs of all coal importers. Its sulfur content places some limitations on its uses. But these deterrents should be seen as extra marketing challenges, not as barriers to success. Illinois Basin coal producers may have to work harder to develop markets for their product, but these markets can be found.

Before I turn to our distinguished list of witnesses, let me offer a few words to some of those who are present today. To the mineworkers of our region, I urge you to keep your best in the world reputation for on-the-job reliability, and work as hard as you always have to produce coal at competitive prices for worldwide sales.

To the coal company executives, I urge you to market your products as aggressively as you can, helping potential buyers find maximum use for the high-sulfur coal you have to sell. The Governor, has informally delegated to me the responsibility to serve as the export sales manager for Illinois coal, corn, beans, and manufactured goods and services in the U.S. Senate. I love the role, I enjoy being that promoter. We have the greatest products in the world to promote. Put me to work! The foreign dignitaries who come to the United States from around the world, come to the White House and to the Foreign Relations Committee. I have an opportunity to meet privately with every one of them. Wherever possible, I will talk to them about Illinois, its many fine products, and my hopes for increased trade between their nation and our great State.

Last night, a young lady came up to me and asked when environment interest would have a chance to speak on coal exports. Obviously, other sovereign nations have the right to establish emission restrictions on their own countries. But we must continue to work closely with the environmentalists in this country to see that coal is mined and shipped in an ecologically sound manner. We want our friends in the environmental community to join with us in our effort to increase, especially, the international coal trade from Illinois for the benefit of the world.

Finally, to our foreign guests, perhaps our most important guests, we are honored by your presence here today. Let me say, as chairman of the Foreign Relations Committee, that I will do everything that I can to see that the United States is a consistent and reliable exporter of coal. You have every reason to expect this from us. I ask only that you give Illinois coal producers a fair opportunity to meet your needs. I expect that you will find that they can. I want to express deep appreciation to the heads of your governments for each of your presence here today. I intend to write or call each of them to express my appreciation for your participation. We all look forward now to hearing what our witnesses have to say.

As my staff has informed all of you, we are operating under a rather tight schedule this morning. I'd appreciate your keeping your oral statements as brief as possible so there is adequate time for questioning. I assure you that your full written statements will appear in the final hearing record, which will be printed by the Senate and made available for distribution.

I am happy to acknowledge the presence of our distingished member of Congress in whose district we convene today. Paul Simon has been a strong supporter of coal, coal exports, coal production, and harmony in the coal industry for many, many years. He is a brilliant man, a colleague with whom I am very proud to serve.

I have, in fact, asked Representative Simon to Chair the hearing beginning at 11:45 today. At that time, I will have to leave to officially open my new U.S. Senate office here in Carbondale, I think the first U.S. Senate office that has ever been in Carbondale. I would very much appreciate Congressman Simon just coming up and joining me here. He will begin his questioning at 11:45 when I leave. But Paul, if you wouldn't mind just sitting up here, I'd appreciate it very much indeed. Let's give Congressman Paul Simon a big hand. [Applause.]

Representative SIMON. If I may, Senator, just let me express my appreciation on behalf of the people of Southern Illinois, and not only the people of Southern Illinois, but coal people everywhere, for your leadership in putting this meeting together, and we appreciate your being here.

Senator PERCY. Thank you very much, Congressman Simon.

Our first witness for session 1, entitled "Emergency Utilization of Coal," is Dr. Ulf Lantzke, the Executive Director of the International Energy Agency in Paris. He has had that position since 1974. Dr. Lantzke received his doctorate in law from the University of Munster in Germany. He entered the Energy Policy in Raw Materials section on the German Ministry of Economics in 1957 and directed the Subcommittee of Mining from 1966 to 1968. Dr. Lantzke, therefore, has long had an interest in coal. From 1968 to 1974, Dr. Lantzke directed the Energy Policy and Raw Materials office within the Ministry of Economics, and was the key West German representative to international meetings in the energy field.

Dr. Lantzke became Special Energy Advisor to Secretary General of the Organization for Economic Cooperation and Development in May 1974, and as is well known, in November 1974 was named Executive Director of the International Energy Agency. Following its creation by the OECD. In 1979, Dr. Lantzke was named Coordinator of Energy Policies for OECD while retaining his responsibility in the International Energy Agency.

We are indeed pleased to welcome Dr. Lantzke, who has made a special trip from Paris in order to be with us. Dr. Lantzke, we look forward to hearing your testimony at this time.

TESTIMONY OF ULF LANTZKE, DIRECTOR, INTERNATIONAL ENERGY AGENCY

Mr. LANTZKE. Thank you, Mr. Chairman, I have filed my witness statement, and I will just summarize it this morning in order to be in time for questions.

The first point I want to make is that the International Energy Agency and its 21 members have recognized at the outset that coal is a most important single option to change the energy infrastructures of our energy economies over time. They published in 1978 a report called "Steam Coal Prospects to 2000," where we state that we should encourage, as governments and as the IEA, the doubling, more than doubling, of coal by the year 2000, and we have also agreed within the agency, within the 21 governments, a point you have already referred to as the confidence building measures, IEA principles for Action on Coal. They are outlining all the elements where coal production, transportation and use might meet with difficulty; they also laid the ground for more reliable trade conditions in the coal area. We finally have established as an operational instrument, the Coal Industry Advisory Board at the IEA where industry is advising governments on all elements of the coal chain.

The second point I'd like to make is that we believe that coal is indeed the most promising option, and that nearly two-thirds of additional energy needs of the world up to the year 2000, could be covered by coal. If that would happen, by the end of the century we might have coal as the single most important energy source, again contributing to the energy balance. We see a possibility, this is not a forecast, Mr. Chairman, but we see a possibility that coal might cover up to 35 percent of world energy needs, whereas, oil might fall back from 50 percent today to somewhere between 25 and 35 percent. This will not happen unless industry is taking up the challenge.

The role of the United States in this context we see as one of the most important, because without a major commitment of the United States to export steam coal, all these possibilities can't be realized. We estimate that U.S. annual coal production would have to go to around 1.2 billion tons by the year 1990, 150 million tons of exports included in that figure. And that by the year 2000, U.S. production could be about 2 billion tons and exports could increase to as much as 300 million tons, which would be about 50 percent of the coal exports of the coal trade that would be needed.

It is obvious that there are quite a number of obstacles to overcome in order to realize such a role, in particular, in the infrastructural area, there are problems to be resolved, creation of the necessary loading facilities and ports in the United States. I don't think that at the receiving end is, Europe and Japan real difficulties exists, because the plans and action are under way.

The benefits we see for the United States are economical, political and strategic. Coal can provide the United States and the other Western economies with an alternative to continued oil imports from uncertain sources; coal exports will improve the U.S. balance of payments; and for local communities, coal would mean new jobs and increased tax revenues. In this general picture we believe that, also, high sulfur coal, as it is produced in this area, can make a major contribution, our IEA Coal Research Center in London suggests that sulfur oxide emissions can be kept to environmentally acceptable standards with known technology, and we also believe that the cost of doing that will still leave coal to be a competitve energy source.

There is not too much known about the emergency role that coal can play. In general, I would say to develop large scale coal trade on a short-term basis will be difficult, and we will have to rely basically on available inventories or local production to do so. However, in individual countries, there is a possibility, and we see clearly the need to develop further studies which would show to what extent short-term shifts from oil to coal are possible in an emergency. Let me conclude:

First, coal, which once fueled the industrial revolution is gathering momentum again, and probably will be the most important single source to change our energy structures.

Second, the challenge of the next 20 years for increased international utilization of coal is to mine, transport and trade enough coal to IEA demands equivalent to around 40 million barrels of oil a day, this is a large increase compared to the present level of IEA coal requirement which are equal to about 50 million barrels a day.

Third, political support at the highest level is already behind the coal option, but general commitments still need to be supported by specific measures of consistent long-term coal policies. For success, close cooperation between industry and government will be essential, because while governments provide the framework in which national economies and new energy systems develop, the responsibility for getting the job done rests with industry. The economics, as we see them today, are favorable; the technology for using high sulfur coal, is available, major environmental problems in production and use do exist, but, in my view, are soluble. Thank you, Mr. Chairman.

Senator PERCY. Thank you, Dr. Lantzke, very much. I cannot tell you how appreciative we are to you for making the trip to be with us. This is a message which all American coal producers—in fact, all American business people—should hear and understand. Thank you for your stirring remarks. I've gone over a speech that you gave last month, Dr. Lantzke, in which you mention that there has never been a greater need for governments and industry to work in concert to establish a constructive and active coal utilization strategy. Would you also include labor in that category? In many ways over the years, the coal industry and its miners have worked side by side in this country to achieve common goals and objectives.

Mr. LANTKZE. Mr. Chairman, I certainly would include labor, because without the support of the unions, I think that the coal option in international business would remain an uncertain option. We would have to convince unions and miners that they're contributing to a more balanced energy future. This does not exclude, that they also pursue their specific goals; but they should also be involved in the feeling that they are aware of the need to keep up stable conditions for coal trade. In my own country, the coal industry is one of those sectors, in which labor is organized to a high degree. I was, myself, a neutral member on the suprvisory board of our coal company at one time. And from that background, I know that it is possible to develop mutual satisfactory conditions for stable conditions in the industry.

Senator PERCY. You have laid out goals of doubling and tripling coal usage by IEA member nations. If that does materialize, as we think it must materialize, how important a role do you see for the high sulfur Illinois Basin coal? How important a role can our coal play in meeting worldwide coal use targets?

Mr. LANTZKE. There are sectors in industry where high sulfur coal can be utilized without further difficulties. One sector, certainly, is the cement industry, where no environmental damage would have to be expected from using high sulfur coal. On the other hand, we must recognize that, in general, we must develop solutions which meet justified environmental concerns. And these environmental concerns exist in all countries, perhaps even more so in the potential receiving countries of high sulfur coal in Europe and Japan. So, what is needed is the development of new technologies, they are, in principle, available as a concept, but we will have to pursue further the demonstration that coal can be burned, high sulfur coal, can be burned in environmental acceptable ways. That is one of the tasks ahead.

Senator PERCY. I am familiar with what the United States is doing to stimulate conversions to coal. I am not as familiar with powerplant conversion plans in Europe and Asia. What can you tell us about the current status of utility conversions to coal abroad? What can you tell us about new plant construction, about harbor expansion plans and so on?

Mr. LANTZKE. In the transportation sector, there is a new coal port being built in Rotterdam. In the Mediterranean area, there will have to be built receiving stations with plans on the way. On the utilities' side, there practically exists in many countries in Europe a ban on the building of new oil-fired power stations; and given the difficulties, some countries are going through in developing the nuclear option, they are bound to build coal-fired power stations; this process is well on the way, and it is understood that these coal needs can only be met by imports. I register over the last 2 years a very high activity of European potential investors looking for investments in the United States and looking for long-term contracts.

Senator PERCY. One last question on the perception of foreign coal buyers about Illinois Basin coal producers. Do you feel that foreign buyers tend to group coal producers from this region together with East Coast producers, and in the process mistakenly presume that the obstacles which plague east coast coal shipments—tie-ups along the rail lines and in the ports, for instance—plague Midwestern coal shipments, too? Or, on the other hand, do some foreign buyers acknowledge the much brighter situation facing coal producers here, with the Mississippi River, a superb rail network, and several Gulf ports close at hand?

Mr. LANTZKE. I think that the potential users are fully aware that in order to develop the coal option to its full extent, that eastern, midwestern, and western coal will have to contribute. Our assessment is that coal, western coal, will have to increase considerably by the year 2000. And I am convinced that the potential users certainly are aware of that.

Senator PERCY. Do foreign coal purchasers feel that the United States is a highly reliable supplier of coal? Are there other countries, such as Australia, South Africa, and Canada, which are given a little higher marks in this regard?

Mr. LANTZKE. I believe that there is some concern that in times of emergencies, the United States might sooner cut back on coal exports rather than on domestic use. And it certainly would increase confidence if what essentially has been laid down in our principles for action on coal could be confirmed at a very high level, namely that in cases of shortage, in cases of emergency, there will be no discrimination between imports and exports on a long-term basis.

Senator PERCY. You may know that I am close to securing the support of the Reagan administration for a bill which would remove from the President the right to unilaterally use his authority to embargo agricultural exports. In fact, under the legislation, if he embargoes anything to a country, he's got to embargo everything. That's a very severe measure. Certainly, this sort of measure should go far toward removing any doubt our foreign friends may have about the reliability of American coal exports.

Dr. Lantzke, I have a few additional questions, I'd like to submit to you for the record. Again, my sincerest thanks for joining us today.

Representative Simon. If I could, if my colleague would yield for just one question here. Dr. Lantzke, you mentioned the infrastructure, our government has to work on infrastructure, you did not mention research. Do you have any comments on that, particularly as it relates to high sulfur coal?

Mr. Lantzke. Yes, we do believe that some intensive research for it still is necessary in order to utilize coal to the extent that I have indicated. We will have to further develop the technologies for environmentally acceptable utilization of coal; we have several projects, cooperative projects, within the IEA on their way, as well as quite a number of national projects. We think that these projects will have to be pursued vigorously, in order to avoid that environmental concerns endanger the coal option. The financial means for doing that are relatively limited. Work to date has reached a state which is promising and should be brought to a head.

Representative Simon. I thank you, Dr. Lantzke.

Senator Percy. Thank you very much. Thank you, Doctor, you've been very helpful.

[Dr. Lantzke's prepared statement and responses to written questions submitted by Senator Percy follow:]

PREPARED STATEMENT OF ULF LANTZKE

INTRODUCTION

I am the Executive Director of the International Energy Agency (IEA), which is headquartered in Paris, France. The subject of my testimony this morning is the potential for world coal expansion in industrialised countries and in particular, the critical role of the United States in this task.

The International Energy Agency is 21 industrial nations working together in the energy field to solve their energy problems and to manage the transition from oil-based economies to more diversified energy economies in the future.

Coal offers one of the most important opportunities to make this transition successfully, and it has been a central part of the IEA programme over the last several years.

In 1978, the IEA published *Steam Coal Prospects to 2000*, which concluded that coal use and production should be encouraged to more than double by the year 2000. A new world steam coal trade was viewed as essential in achieving this objective.

To spur coal development and to build confidence between the major producing and consuming countries, IEA Energy Ministers agreed in May 1979 to Principles for IEA Action on Coal. The Principles created a mutually accepted political framework to promote the rapid expansion of coal and a world steam coal trading system.

To provide for more government-business cooperation at the international level, the IEA established a Coal Industry Advisory Board (CIAB) composed of senior executive officers of companies with an interest in coal either as producers, consumers or builders of coal infrastructure. The Board gave its first report to IEA Ministers last December.

These activities have given us an international perspective on both the problems and the potential for expanding production, use and trade of coal and I would like to share with you some of our major conclusions.

II. LONG TERM ENERGY OUTLOOK AND THE ROLE OF COAL

The 1980's and the 1990's must be a period of major transition toward energy economies no longer dominated by oil use nor dominated by any other single source—being characterised by a much more balanced structure by energy source. With strong policies to promote coal, nuclear energy and conservation, the IEA estimates that oil as a percentage of IEA countries' total energy supply can be reduced from 50% today to about 25% to 30% by the year 2000. This means that oil imports into IEA countries can be reduced from 22 million barrels of oil a day (mbd) today to 15 mbd by the year 2000.

To achieve this scenario, IEA coal production and use would have to almost double by 1990 and triple by 2000. World trade in steam coal would have to increase 10 fold—to about 700 million tons of coal.

Coal could meet almost two thirds of the additional energy requirements in IEA countries between now and the year 2000. Such an increase in terms of energy would be comparable to present OPEC production. World trade alone in coal would be about the energy equivalent of present day Saudi Arabian oil exports.

Coal could surpass oil as a contributor to IEA energy supplies increasing its share from 20% today to 35% in the year 2000.

Achieving this type of future will not be easy and it still is uncertain if it can be achieved. The IEA Coal Industry Advisory Board has concluded that a doubling of coal use by 1990 and a tripling by 2000 will not happen unless production and transport infrastructure is expanded in a timely manner and more activity takes place on the user side to substitute coal for oil in electric generation and industry.

Nevertheless there has been considerable activity over the last two years. Coal demand is high, coal production, despite some recent problems in the U.S., Poland and the United Kingdom is also swinging upward. This suggests to me that we are witnessing a coal revival and this early momentum must be sustained.

III. THE ROLE OF THE UNITED STATES

U.S. commitment

The only way industrial countries can reach this goal is with a major U.S. commitment to export steam coal.

U.S. potential production and export

U.S. annual coal production of 1.2 billion tons, and exports of 150 million tons by 1990 are urgently needed. By the year 2000, we look for U.S. production to be about 2.0 billion tons and exports to increase to 300 million tons yearly. This would require a ten fold increase in surface mine production in the West as well as at least a doubling of Eastern underground coal mining.

U.S. ports

Infrastructure would have to be built to transport coal to potential domestic as well as overseas markets. In 1980, U.S. exports of coal were up by 40%. The American coal industry responded, but congested port facilities resulted in high costs that were borne by the buyers, as ships waited to be loaded. A major expansion of loading facilities to handle large coal-carrying ships is essential.

Reliable coal supplier

The United States should work with potential coal using countries in Europe and Japan, to build confidence that the U.S. is interested in becoming a reliable coal supplier. Prompt attention to port and other infrastructure problems, would assure U.S. trading partners of U.S. intentions.

Benefits for the U.S.

For the U.S. economic, political and strategic benefits could be substantial; coal can provide the U.S. and the other Western economies with an alternative to continued oil imports from uncertain sources; coal exports would improve the U.S. balance of payments; for local communities, coal would mean new jobs and increased tax revenues.

IV. HIGH-SULPHUR COAL

Given this general world and national outlook I am pleased to see so much interest in this part of the country to expand both your domestic and overseas markets.

The high sulphur coal is rich in energy content and studies made by the IEA Coal Research Centre in London suggest that sulphur oxide emission can be kept to environmentally acceptable levels with known technology.

However, it must be recognized that the problem of protecting the environment is a worldwide concern. Generally, it has developed objectively as opposed to being solely an emotional, political issue. It has become an element of value judgment in making the difficult choices and tradeoffs between energy development and maintenance of viable environmental conditions of life. The Clean Air Act in the U.S. is one reflection of this concern. Similar types of views exist in export markets.

The problem is severe and can only be overcome by new technologies. As a consequence further demonstration of known technological paths must be developed, not only in the U.S. but also in potential export markets if high sulphur coal is really to have the role which may be needed for it to provide a contribution to more balanced world energy markets.

V. EMERGENCY UTILIZATION OF COAL

I would like to say a few words about the emergency utilization of coal, trying to answer the basic question to what extent could coal be substituted for oil in a short term crisis.

Our knowledge in this area is limited. Normally at the IEA we have viewed coal as primarily a long term alternative. Lead times are long in getting the world steam coal trade infrastructure built and until now I do not believe that anyone could imagine a situation where U.S. coal, for example, might be supplied to Europe or Japan in a short term crisis.

However, I believe that this question deserves attention. For an oil crisis of only a few months, the response may take too long to substitute coal internationally, although every effort should be made in those countries, like the U.S. who have coal resources at home to substitute those resources domestically. On the other hand, if we do get into a situation of chronic oil shortage—which might occur during the mid to late 1980s, then moving adequate quantities of coal in a timely manner may be essential to sustain the economies of the Western world.

VI. CONCLUSION

First, coal, which once fueled the industrial revolution is gathering momentum to provide the single most important energy contribution to the future of modern societies. Given uncertainties about the future role of nuclear power and the long lead times for commercialization of new and renewable energy sources, the conclusion is inescapable that coal must play a vital role in our energy future.

Secondly, the challenge of the next twenty years for the increased international utilization of coal is to mine, transport, and trade enough coal to meet IEA coal demands equivalent to 40 million barrels of oil a day. This is a large increase compared to the present level of IEA coal requirements which are equal to about 15 million barrels of oil a day. The potential exists, but there are serious obstacles to be overcome.

Thirdly, political support at the highest level is already behind the coal option. But general commitments need to be supported by specific measures of consistent long-term coal policies. For success, close cooperation between industry and government will be essential because while governments provide the framework in which national economies and new energy systems develop, the responsibility for getting the job done rests with industry. The economics are favorable; the technology is available; and major environmental problems in production and use exist, but in my view are solvable.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY

Question 1. Dr. Lantzke, how do you think the United States is currently viewed as a coal exporter from overseas? Is our country seen as more reliable, or less reliable, than we once were? Are we seen as more reliable, or less reliable, than other coal exporters such as Australia or South Africa? What are the biggest problems other governments feel the U.S. will have to overcome before it can increase its coal shipments? Do foreign coal buyers generally draw distinctions between the railroad and port situation on the East Coast, which does not affect Illinois coal, and the brighter situation down the Mississippi River and at the Gulf ports, which does?

Answer. I believe that there is general and increasing recognition on the part of potential buyers of U.S. coal that the United States Administration and industry are both serious in their desire to increase coal exports and ready to work together to see that this happens. Coal exports would obviously bring important benefits to the US economy. So far as I am aware, there is no feeling that the United States is not likely to be a reliable supplier of coal and recent Administration initiatives including the July statement of Secretary Baldrige have helped to reassure potential customers. Nevertheless, there are a number of logistical problems that became evident in 1980 which require resolution if U.S. coal exports are to expand smoothly. These mainly have to do with storage, handling and loading facilities at U.S. ports in the short term and, over the longer run, assuring the adequacy of inland transportation from mine to port and dredging access channels to allow economies of scale in ocean transport. The problems on the East Coast obviously captured most attention in 1980 and may well have led to general attitudes of concern with regard to other ports although I have no indication that this was in fact the case.

Question 2. Are there any specific changes which IEA member nations have detected in American coal export policy since the entrance of the Reagan administration?

Answer. The current U.S. administration has taken a number of welcome measures to expedite coal development and, in particular, coal exports, including its proposal to accelerate leasing, the proposed legislation on dredging, and the very clear statement by Secretary Baldridge on 17 July that "the administration will not interrupt coal trade under contractual commitments unless forced to do so by a severe national emergency."

Question 3. Your testimony touches only briefly on the role which coal might play in helping IEA countries adjust to an international energy shortfall. It is true, as you note, that coal cannot be used as universally as oil, or as quickly as we might like in some sectors. At the same time, you acknowledge that immediate conversion to coal could take place in some areas of the world if the need arose; the United States is one such area. What are the IEA's current plans to study, and comment on, the international potential for increased emergency coal utilization and coal sharing? What can the IEA do as an organization to develop strategies to maximize the world sharing of coal reserves in the event that such an action is needed following an oil shut-off?

Answer. Emergency sharing of coal in the face of an oil shut-off is a possibility that could be examined within the IEA but to date there has been no impetus to look at this issue from any Member country. It is extremely complicated and it would be misleading to draw simple analogies from the operation of the oil sharing system since the structure of the industry is very different, world trade is not yet fully developed, and coal is a much more heterogeneous commodity than oil, which cannot always substitute easily for oil, even in non-transportation uses. Nevertheless, the basic concept that coal might play an important role in such a situation is worth considering and I would think that, at least in the first instance, national governments in their own contingency planning should assess where and how coal might be used on short notice to ease a political oil disruption.

Question 4. It is likely that the environmental standards generally in force during a world oil shortage would be different, and perhaps more lenient, than those in use under normal conditions. Would high-sulfur coal be likely to find international applications in coal-fired units than it would during noncrisis periods? Would Illinois coal, and other high-sulfur coal, be a viable stockpile fuel in the event of an international energy shortfall?

Answer. Whether high sulfur coal could constitute a viable stockpile fuel in the event of an international energy shortage is a difficult question and would depend not only upon where and how coal could substitute for oil at short notice, but also upon the magnitude, duration and nature of any oil supply shortfall. Our past experience has shown that each disruption has had its own characteristics, political and economic, and those have been quite different. It would therefore be extremely speculative and hypothetical to attempt to be definitive. Similarly, the willingness of individual countries to relax environmental standards in times of world oil shortage would most likely depend upon the nature of the disruption and conditions in individual countries.

Question 5. I understand that on June 15, the IEA Governing Board at the Ministerial Level met in Paris. Part of the meeting reportedly was devoted to an update on international coal marketing strategies from the Coal Industry Advisory Board. Can you tell us specifically what came out of your recent meeting on the issue of coal planning?

Answer. The chairman of the CIAB, Mr. Camicia, reported to Ministers on the ongoing work of the Board, including analysis of the potential for coal use in industry in the OECD and the development of a proposed coal information system. Both of these activities are being managed by CIAB task forces and the two reports will be reviewed by the CIAB at its meeting of October 15. Mr. Camicia's report was well received by ministers who endorsed the CIAB work and urged the Board to continue to assess and advise governments on the overall potential to increase coal use and/or production in individual countries and on possible options to realize such potential. Ministers also emphasized the need to examine the adequacy of infrastructure for exporting and importing greater quantities of coal and to examine ways to alleviate potential constraints, for example through the conclusion of long-term contracts. Finally, Ministers agreed that there would be a full review of Members countries' coal policies and programs in 1981 and they asked that the CIAB contribute its views on coal developments, prospects and problems to this Review.

Question 6. What has been the IEA's past budget allotment for coal research? What is the IEA's current budget in this area? Please describe the major coal utilization research projects which the IEA is funding, and cite sources of support. Is the IEA's budget for coal research planned to increase in the coming years (in real dollars)?

Answer. The IEA does not have any energy research and development budget as such. It plays a coordinating and catalytic role in bringing Member governments and private interests together to jointly sponsor research and development activities of mutual interest. There are at present about 50 ongoing collaborative projects, of which ten deal with various aspects of coal including basic information gathering and assessment, pressurized and atmospheric fluidized bed combustion, pyrolysis, dry coal feeding, coal/liquid mixtures, and low nitrogen oxide burners. More detailed information on participation in the various programs is available in the 1980 "Annual Report of Energy Research Development and Demonstration Activities of the IEA."

The IEA also monitors expenditure on R. & D. by Member governments. Table 1 provides information on trends in coal-related R. & D. relative to total government energy R. & D. expenditure, and Table 2 provides a breakdown of 1980 coal-related R. & D. expenditure in Member countries. These figures do not include industrial expenditure on coal R. & D. Table 1 shows an eight-fold increase in coal-related R. & D. from 1974 to 1980. The share of coal-related R. & D. has almost doubled over this period. Most (about 90 percent) of coal-related R. & D. is concentrated in the United States (63 percent), Germany (15 percent), and Japan (11 percent). More than half of total coal R. & D. is for conversion, with the rest split fairly evenly between production/preparation/transportation and combustion. In the former category, the United States (52 percent) and Germany (38 percent) account for the bulk of expenditures. In combustion, roughly half of the expenditure is by the United States, with Japan accounting for about 24 percent and Germany 11 percent. The United States accounts for about 74 percent of expenditure on conversion, with Japan and Germany accounting for 14 percent and 9 percent, respectively.

TABLE 1.—IEA GOVERNMENT R.D. & D. BUDGETS, 1974-80

[In millions of U.S. dollars]

	1974	1975	1976	1977	1978	1979	1980
Total budget	2,001	2,748	3,141	5,625	5,826	7,092	8,380
Coal budget	116	NA	NA	585	594	766	955
Coal (percent of total)	5.8	NA	NA	10.4	10.2	10.9	11.4

TABLE 2.—COAL R.D. & D. ACTIVITIES IN IEA COUNTRIES, 1980

	Production preparation transportation	Combustion	Conversion	Other	Total
Total budget (million, U.S. dollars)	192	148	532	103	955
Percent share	18	15	56	11	100

Senator **Percy**. The Chair will call the witnesses for Section No. 2, entitled "High Sulfur Coal Exports, Foreign Government Officials." Mr. David Lan Cheng, vice president of Taiwan Power Co., and Mr. K. S. Chang, the Minister of Economic Affairs, are today's witnesses representing the Republic of China. Mr. Chang is a chemist by training and is vice president of the Chinese Petroleum Corp. The Government of China may well prove to be one of the best customers for Illinois coal exports.

Representing Spain, we are pleased to welcome Dr. German Dominguez, the Industry and Energy Attaché for the Spanish Embassy in Washington. He will read the statement by Mr. Jose Sierra-Lopez who is unable to attend. Dr. Dominguez is from the Spanish Nuclear Energy Agency's Division of Isotopes.

Next is Mr. Bong Suh Lee, assistant minister in the Ministry of Energy and Resources of the Republic of Korea. Coal is becoming an increasingly important part of Korea's energy program, and I had the pleasure to meet with some of Korea's highest ranking energy officials in Korea just 2 months ago.

Our witnesses from France are Mr. William G. M. Daniels, the director of the North American Delegate of ATIC, the French coal importing company, and Mr. Jean Faucounau, representing Charbonnages de France, France's coal mining company.

Finally, we are pleased to welcome Mr. Akira Kinoshita, the deputy director of the Fuel Department of the Electric Power Development Co., representing Japan. Mr. Kinoshita was educated in the Law School of Waseda University, Japan is quickly turning toward coal to replace oil imports for her energy needs. Will our witnesses please take their places?

Mr. Cheng, why don't you start out. Would you care to start, Mr. Cheng?

TESTIMONY OF DAVID LAN CHENG, VICE PRESIDENT, TAIWAN POWER CO., AND K. S. CHANG, ADMINISTRATOR OF PUBLIC AFFAIRS, REPUBLIC OF CHINA; GERMAN HERNANDOZ DOMINQUEZ, INDUSTRY AND ENERGY ATTACHÉ, SPANISH EMBASSY, WASHINGTON, D.C.; BONG SUH LEE, ASSISTANT MINISTER, ADMINISTRATION OF ENERGY AND RESOURCES, REPUBLIC OF KOREA; WILLEM G. M. DANIELS, DIRECTOR, NORTH AMERICAN DELEGATE, ATIC, AND JEAN FAUCOUNAU, CHARBONNAGES DE FRANCE FOR FRANCE; AND AKIRO KINOSHITA, DEPUTY DIRECTOR, FUEL DEPARTMENT, ELECTRIC POWER DEVELOPMENT CO., JAPAN

Mr. **Cheng**. Mr. Chairman, thank you very much for letting us express our views. Our Minister of Economic Affairs is the Honorable Mr. Chang, who will make his statement on behalf of the country, the Republic of China. Thank you.

Mr. **Chang**. Mr. Chairman, it is indeed a great pleasure and a privilege for me to attend this hearing to present my views on "The Role of Steam Coal in the Republic of China on Taiwan." Adequate energy supply is indispensable to the social and economic development of a nation. The economy of the Republic of China has been growing very fast during the last 2 decades, at a rate averaging more than 9 percent annually. Despite the adverse influence of international economics slowdown, and sky-rocketing oil prices, ROC's rate of economic growth in 1980 still reached a respectable 6.7 percent in real terms as against 0.3 percent for industrial countries, and 4.1 percent for less developed countries. The country's per capita income will be about $2,500 U.S. dollars in 1981. The worldwide two-way trade for our country reached 39.50 billion U.S. dollars in 1980, an annual increase of 27.9 percent over 1979.

The United States is, by far, our largest trading partner. Total trade between ROC and the United States, will probably reach 14 billion dollars in 1981. For the next 10 years, the aggregate total between the two countries is estimated at $250 billion. And I predict eventually, coal will be the single largest export commodity from the United States to the Republic of China. Poor in indigenous energy resources, ROC needs increasing quantities of imported energy to sustain economic growth. Presently, the demand of total energy amounts to 35 million tons of oil equivalent, and 86 percent of it is imported mainly in the form of petroleum. Conservative estimate of demand growth will be approximately 10 percent annually, depending upon how successful our conservation program will be, our oil policy calls for vigorous efforts for energy conservation, strengthening the exploration and exploitation of indigenous energy, however limited, and diversifying the kinds and sources of energy imports, so as to reduce the reliance on petroleum and to alleviate the impact of the possible shortage of oil supply on the economy.

Petroleum from the Middle East used to be our principal imported energy. Since a few years ago, we have built no more oil-fired powerplants. Any new powerplants will be either coal or nuclear. Coal will also be utilized in the industrial plants wherever possible. Coal and uranium imports are expected to increase very rapidly. Import of coal is expected to increase by 16 percent annually, while import of oil only 5.7 percent.

As of the end of May 1981, Taiwan's Power System has a total installed capacity of 10,000 Mw, of which 1,400 Mw is hydro, 5,400 Mw is oil, 980 Mw is coal, and 2,000 Mw is nuclear. This year, in 1981, power needs 3 million tons of coal. Our long range power development program calls for a total installed capacity of 33,600 Mw by 1995; of which 4,600 Mw will be hydro; 3,760 Mw will be oil; 12,250 Mw, or 36 percent of the total, and 12,940 Mw will be coal, or 39 percent, will be nuclear. By then, by 1995, annual demand of coal for power will be 31 million tons.

The requirement of steam coal for the existing and new coal fired units is projected with due considerations given to the quality and availability of coal, the characteristics of generating facilities, the optimization of system operation, and so forth. Provisions for a transportation loss of 4 percent of the total consumption, and stock for maintaining a 5-month inventory are also included in the projection. The future demand of steam coal for industries would be considerable, although, much less than for power. Some major energy users, such as cement, are now being required or encouraged to change from oil to coal as energy source. According to our projection, the total steam coal demand for industry in the year 1995 will be 11.4 million tons.

Virtually, the total demand of 42.4 million tons for power and industry combined, will have to be imported. The importation of such a vast quantity of solid fuel is a matter which needs our greatest attention and most careful planning.

The first thing to reckon with is the sources of coal for imports. At least in the foreseeable future, only a few countries in the world are able to export coal in considerable quantities. As far as we are concerned, except for some possible diversified supplies in the world, the United States will in all probability be our prime source. Taiwan Power Co., our largest coal users, intends to acquire coal either on the basis of long-term purchasing contract, or in the form of joint venture on development of coal mines in exporting countries, so as to insure coal quality and supply.

Of great importance are the long distance transportation over land and sea, and the handling of coal at the ports of loading and unloading. Taiwan Power Co. plans to build a major portion of the coal fleet required for ocean transportation. A first fleet of three vessels of 125,000 dwt, and 6 vessels of 63,000 dwt coal carriers have been contracted to be built in Taiwan, and will be made available by 1984 or 1985. More coal carriers will be built in accordance with future coal requirements.

Unloading facilities in Taiwan are either in construction or being planned to handle imported coal. Air pollution control is bound to be more and more strict. In view of the limited availability of low sulfur coal and the successive addition of coal fired units to the power system, blended coal would be considered for power generation.

Our new power plant will be designed with the flexibility of firing blended coal. According to preliminary laboratory test for blending low sulfur coal from Western States sources and 3 percent high sulfur coal from Eastern States in proper proportion, the quality of such blended coal could meet the current specifications for importing steam coal. Taipower has to import large quantities of steam coal for power generation, and has been actively seeking for coal source. Up to date, a total of 92 million metric tons for 1981 to 1995 has been contracted, and a total of 17 million metric tons for the same period is still under negotiation. Industry is also looking for coal resources.

For the next 15 years, the aggregated total demand of imported coal is estimated at 350 million tons, and coal will comprise 32 percent of our total energy. It is apparent that coal will become extremely important to our economy. As I have mentioned about the United States, in general, and Illinois, in particular, will be our most important source of supply of coal.

I hope the information I have given has been of help to you in understanding the role that steam coal plays in the economy of the Republic of China. Thank you very much.

Senator PERCY. Mr. Chang, I really appreciate very much that powerful statement. Thank you very much. Dr. Dominguez?

Mr. DOMINGUEZ. On behalf of the Ambassador of Spain——

Senator PERCY. Doctor, could you just, for one moment—in the House of Representatives they have a 1-minute rule. It's not necessary to observe that in the Senate, but we do have a 5-minute rule, and I'd like to suggest that we try and observe that rule here, if possible. As occurs in the Senate itself when we have a 5-minute rule, a green light will go for several minutes, with the yellow light coming at 4 minutes and the red light at 5 minutes. At that point, the rest of any statement being presented will be fully incorporated into the record.

Mr. DOMINGUEZ. Thank you, Mr. Chairman. On behalf of the Ambassador of Spain, let me tell you, first of all, that he is very grateful to you for this opportunity to present the point of view of my country about the Spanish demand of steam coal and about the role that the United States may play to meet this demand. I appreciate your kind invitation to me and to Mr. Sierra to be here today. But, as you know, Mr. Sierra has been retained in Spain by a summons from our Parliament. However, he has prepared the statement that I will present in the shortest possible form in the interest of time.

Spain, with a population of 37 million inhabitants and an energy consumption of 78 million Btu per person per year, is very far away from self-sufficiency, because of the very important role played by oil; our oil trade balance showed a deficit of $11 billion in 1980, about 6 percent of our gross industrial product. This is too heavy a load for our economy.

In Spain, just like in most countries, coal was the major industrial development component, especially around the 1940's, but the increase in coal use ended during the 1950's, although the substitution process was more drastic in Spain than in other European nations, and, therefore, there is no other country in Europe, except Italy, as dependent on oil as Spain is. Coal's participation in Spain came down to 16 percent in 1978, from 74 percent in 1950, even though energy demand more than doubled. However, the adjustment to the impact of the energy crisis of 1973 and 1979 gave way to the recovery of the coal sector. Coal production increased from 14 million metric tons in 1975 to 37 million tons in 1980. Coal's share of total primary energy consumption in 1980 was 20.7 percent, but that of oil was 64.6 percent, and hydro was 10.4 percent only.

The Spanish energy problem is, like in most of the Western nations, how to switch from oil to alternative energy sources. The current national energy plan foresees that oil will not even account for 50 percent of the total primary energy required during 1987. Toward this goal, the plan intends to develop a wide nuclear powerplant construction program, utilize existing hydraulic resources to their maximum, increase national energy production and coal and gas consumption in the best measure possible. This way, it is expected that of the total 3.7 quads to be required in 1985, coal will supply 23 percent, oil 49 percent, nuclear power 11 percent, hydro 10 percent, and gas 7 percent.

A structure of primary energy sources, such as the one indicated, calls for extensive use of steam coal, which will be influenced by the following factors: Oil scarcity, changes of the time required to put nuclear powerplants in service, annual hydroelectric energy production, the country's energy needs, and the share of the market that coal can take in accordance with its price compared with the price of oil. Spain's future steam coal demand will basically come from three sectors: Electricity production, industry, and residential/commercial. The current thermal powerplant construction program is aimed at the addition of almost 7,000 Mw through this decade, and the conversion from oil to coal of more than 2,000 Mw currently installed.

So coal will be used to generate 7,300 Mw in 1983 and 12,300 Mw in 1987.

The industry sector, which includes an ongoing program for reconversion of the cement industry, will use about 2.7 million metric tons of coal from 1982. The residential/commercial sector is consuming a bit more than 1 million metric tons of coal, and is expected to use increasing amounts in the future, but most of the coal used by this sector will come from domestic sources. To meet the short-medium-term needs of steam and metallurgical coal, the Spanish coal production plan seeks to increase coal production from 12 million tons of coal equivalent in 1980 to 20.6 million tons in 1987. But most of the additional production will be made of lignite. These increases are not enough, however. Therefore, imports of steam coal will increase substantially, although the exact amounts to be imported yearly will depend on the factors I have mentioned before.

In the electricity generation sector, imported coal will either supply powerplants that are being built for burning it, or will compensate for deficiencies in quality and quantity in plants burning domestic coal. On the other hand, about 70 percent of existing cement plants will switch from oil to imported coal because of their location; other plants will use coal from mines in their area. The coal import policy is based on the strategic character and the impact of this switch from oil to coal on the national economy. Areas of special attention include amount and quantity of coal to be imported and to give us an indication of supply. We are also paying a lot of attention to security of supply. So we are seeking opportunities to buy equities abroad and to link our supply to long-term contracts. Another one of our main concerns is ocean transportation. To take advantage of economy of scale, we think that very big carriers have to be used. So we are preparing three ports in the south, the north and in the southeast of Spain, that will be ready in 1984, which will handle ships of up to 150,000 tons dwt.

Decisions on the origin of coal imports will depend on the distance to coal producing countries, their own export capabilities, the availability of new ports in Spain and abroad, stepwise increase of Spanish demand, as well as supply security. All things considered, up to 1984, we will depend on the United States from 60 to 80 percent of our coal supplies. Then, the percentage will be reduced to 50 to 40 percent in favor of the other countries, like Australia, Canada, South Africa, Poland, Soviet Union and China and Colombia. Specifications set up for coal to be used by the cement manufacturing and electricity sectors call for rather low levels of sulfur; the maximum amount of sulfur in coal for cement industry is 2.5 percent. Thank you, Mr. Chairman.

Senator PERCY. Thank you, Doctor, very much indeed. Mr. Lee, we are happy to have you representing the Republic of Korea.

Mr. LEE. Mr. Chairman, it is a great pleasure for me to have this opportunity today in this high sulfur coal exports Senate hearing and conference as a representative of the Republic of Korea.

Within the limited time available, I would like to focus my presentation mainly to the prospects of high sulfur coal import in Korea. In 1980, total consumption of energy amounted to 38 million tons of oil equivalent (toe). Petroleum accounted for 62 percent, and anthracite, 26 percent. Firewood, nuclear, hydro, liquified petroleum gas, and bituminous coal make up the balance. By 1986, the energy consumption is expected to increase to 59 million t.o.e. With this increase, the configuration of energy supply sources will change significantly. Petroleum dependency is expected to decline markedly from the current 62 percent to 48 percent, due to rising substitution of alternative sources, such as coal, gas, and the nuclear energy. Demand for coal is expected to increase to 43 million metric tons in 1986 from the 1981 level of 30 million tons.

Of the 30 million tons of coal consumed at present, 22 million tons are anthracite, and more than 90 percent of its requirement is met by domestic production. The demand for anthracite for the next 5 years is expected to increase only at a moderate rate. More than two-thirds of the 13-million ton increase in demand for coal in the next 5 years is attributable to a greater use of bituminous coal, particularly in the fields of power generation and cement manufacturing. Furthermore, it is forecasted that the steam coal requirement alone in the year 1991 will reach somewhere around 12 million tons. At the present time, we have two coal-fired plant projects under construction. Each project has two 500 Mw plants. Both projects are to be operational by the middle of 1980's. We have already signed contracts with companies from Australia and Canada to supply 4 million tons of coal per year. For an additional 1 million tons, we are now negotiating with several firms from Australia, Canada and the United States.

The future outlook for the demand for steam coal is derived from both the construction of a new coal plant and the conversion of existing plants by substituting coal for oil. However, the nonavailability of bituminous coal in Korea necessitates the import of all required amount of steam coal; hence reliance must be placed on the importing of steam coal from various countries in due course, certainly including the United States in the very near future. However, I would like to express some of the probable barriers we may encounter by importing U.S. coal, particularly high sulfur steam coal.

First, the Environmental Protection Regulation in Korea presently imposes regulation that requires the emission level of sulfur oxides to be below 1800 PPM.

Second; currently, the price of U.S. coal is not competitive in the Korean market. In 1981, for instance, coal from Australia and Canada is being negotiated at about $50 per ton FOB basis. The price of U.S. coal is about $7 higher per ton FOB. In addition to this higher cost, longer shipping distance would raise transportation costs by about $3.00 per ton.

Third; we are considering, at this time, the implications of entering into any long-term contracts involving the importing of U.S. coal. This is due mainly to the possibility that U.S. ports could not adequately facilitate the increased coal movement from the United States to Korea.

Even after considering these possible problems with the importing of U.S. coal, I still maintain optimistic views concerning the utilization of U.S. coal in Korea's near future.

First, I believe that there is ample possibility of utilizing of high sulfur coal in Korea. This can be achieved by either blending coals of different sulfur content with U.S. coal, or by relaxing the sulfur oxide emission regulation. In the near future, we will study the possibility of relaxing the sulfur contents regulations particularly on the power generation plants located in the coastal zones.

Second, although the price of U.S. coal is still high in the Korean market as I have mentioned, the gap between U.S. coal prices and other competing coal prices is narrowing. This is due to the rapid increases in prices of both Australian and Canadian coal. More specifically, the U.S. coal prices were approximately 30 percent higher than Australian and Canadian coal in 1979. Currently, the price differential has been reduced to less than 20 percent.

Third, Korea has been relying mainly on Australia and Canada for importing coal. Korea is now actively searching for U.S. coal for diversifying the source of coal supply for a variety of reasons. This includes uncertainty of delivery caused by labor strikes and congestion in both Australia and Canada. If the United States counterparts become more aggressive in expanding markets and in maintaining negotiations, a "negotiation spirit", I firmly believe that there is ample possibility of opening a new coal market in Korea.

Today's conference certainly is a material proof of such an effort by the United States. I may also note a similar effort exerted by the governor's office of 12 Western States—that is WESTPO—in proposing a joint study, financed by potential exporters and importers, in order to explore the possibility of promoting the use of Western States' coal in the Far East. The Korean Government is in full support of such a proposal and has decided in principle to contribute our share of the research fund. We are equally interested in the future prospect of importing U.S. high sulfur coal and will be an active participant to any such suggestions that will insure a stable supply of coal at a reasonable price in our part of the world. Thank you.

Senator **Percy**. Thank you, Mr. Lee, very much indeed. Mr. Daniels, will you be testifying for France, or sharing your time with Mr. Faucounau?

Mr. **Daniels**. We going to have double time.

Senator **Percy**. Are you both testifying?

Mr. **Daniels**. Yes.

Senator **Percy**. Very good, if you will proceed, please.

Mr. **Daniels**. Mr. Chairman, thank you very much for having called once more upon my association for delivering testimony on behalf of France; this time aimed at exploring the use of American high sulfur coal. But Senator, since you already have made a lot of friends, I will immediately be adding mine, in particular. Before touching the subject, I would like to give some general indications regarding the consumption of coal in France, and the imports.

Of the future French Government, I mean the one that France shall have at the end of next month, will probably have a greater emphasis on the use of coal than the outgoing one. My indications are based on the program of the Socialist party, which heretofore has set an objective by 1990 of a total consumption of 65 million tons to be supplied by domestic production of 13 million tons and 35 of imports.

You will remember that in Baltimore on April 28, when testifying before the Foreign Relations Subcommittee on International Economic Policy, the figures I gave to Senator Charles Mathias were respectively 50 million tons of consumption with the national production of 10 to 15, and imports of 35 to 40 million tons. The emphasis is thus laid on a greater national production with imports more or less remaining at today's level. I will just impress upon you, I am now giving you details regarding high sulfur coal. What is high sulfur steam coal for France? The sulfur content of the French domestic coals being maximum 1 percent, you will not be surprised to hear that the French end-users high sulfur coal is any coal of 11,000 Btu exceeding 1.8 percent sulfur, which means 3.3 pounds of sulfur per million Btu. This is, more or less, the present yardstick. However, in a number of limited cases, the ceiling is being relaxed, but only on the basis of a Btu related content, but in no case above the 2 percent level for 12,000 Btu, which is, again, 3.3 pounds of sulfur per million Btu.

What is the today's situation? In the utilities, no scrubbers are installed, they only have ash precipitators, the utilities adhere very strictly to the 1.8 percent ceiling of those relations, although stringent regulations, strangely enough, do not exist. The utilities are therefore, in a way, buying under a self-discipline constraint. For 1981, we today have about 7 million tons bought from the United States.

I simply know we shall manage to ship them, but I won't dwell on this delicate subject, which I already touched on previous occasions, and which I shall discuss on more occasions to come.

Regarding cement mills, general industry and urban heating, the bracket these consumers are looking for is 1.5 to 1.8 percent, but some of them are already asking for a sulfur content as low as 1 percent for technical reasons. For 1981, we have about 1 million tons of coal under contract from the United States for this category clients.

What about the future? Regarding the utilities, no change is expected in the basic requirements. However, we are currently looking into the possibility of buying mixes—I would not really call them blends—of high and low sulfur coal, provided the volatile content of each component does not differ by more than 2 to 3 percent. These requirements are of great importance, since a larger difference of volatiles in a mix which is not strictly homogeneous may create serious combustion problems. We are presently studying such possibilities out of New Orleans, but it must be realized that such a mix would certainly not have the homogeneity of an east coast blend.

Regarding cement mills, we do not expect any change in attitude for the time being. However, in September, September mix, some of them may turn to some higher sulfur coal, up to 2.3, 2.5 percent, this is an important evolution, and we are expecting more news about their intentions.

Then, we have the general industry and fluidized bed combustions. So far, not much has been done on the subject with today's availability of French and foreign coals with low sulfur content. However, one maker already markets a high temperature fluidized bed boiler. But in France, as well as elsewhere in the world, there are no fluidized bed boilers in operation with low temperatures.

Regarding synfuels, the top limit of sulfur will be much higher. There are a number of projects under consideration.

I regret to say that regarding methanol plants either in France, or more specifically, in the United States, to be built by French interests, the Minister of Industry had no information to provide the last days, where that evaluation is still being carried on for the future of transportation.

Just a minute, one last minute, I would like to revert to two comments made by Dr. Lantzke; first, I may be somewhat chauvinistic, but he mentioned one port, one new port being developed in Europe, I would like to add that three new ports are being developed in France for ships of 120,000, 150,000, or even 200,000 tons. These will be ready in 2 years. And I would like also to support Dr. Lantzke's remarks regarding a total respect by the U.S. Government of contractual engagements made by ATIC with our American suppliers to the benefit of our French consumers. Thank you very much.

Senator PERCY. Thank you very much. Mr. Faucounau?

Mr. FAUCOUNAU. Thank you, Mr. Chairman. As my friend, Willem Daniels from ATIC has given you the plan for French coal consumption over the next few years and made remarks about the use in France of high sulfur coal, I feel free to make some freelance remarks on the subject.

First, it would be an error to believe that the French industry at least, and probably more generally than the European industry, at least, will use the steam coal with more sulfur content than the United States. The 2 percent sulfur content will be in the future like in the United States, the generally accepted limit for ground pollution reasons. Some industries, like cement, will use coal with some higher sulfur content, but, on the other hand, lower sulfur content will be required in some pollution sensitive areas.

My second remark is that it would be a nonsense to believe that high sulfur coal will not develop. I would like here to tell you a French story. In 1956, oil men stirred the vast reserve of natural gas in the southwest of France near the small town of Lacq. These guys had a full art of composition with 70 percent Meton, which is not bad, but 50 percent of sulfur hydrogen. Everyone thought that it wasn't suitable for use because of the pollution, because of corrosion, et cetera.

One year after, the P.A. adopted the old Clouse sulfur converter process in such a way that not only around 7.5 billion of cubic meter/per year had been sold from 1957 to today, but around 1.7 to 1.8 million tons of sulfur per year as a byproduct have made France the main sulfur producer in Europe. The key has been technology. And it's my firm believe that this is also the key for high sulfur coal.

Two main ways, in my opinion, seem to be open. All the desulfurization of the coal on the site, with transformation of coal into a more calorific fuel, or desulfurization at the boiler at the other end of the chain. Concerning the first process, I would like to cite a Swedish carbogel system, for instance, as a new line of research. Concerning the last process, the research of the Argonne National Laboratory to cite one of them, offers the promise the brand new technology on a way to burn coal with a 3.5-percent sulfur content without environmental risks.

A third idea I would like to express is about the kind of complementarity which exists between high sulfur, high Btu coal of the mid-west and central areas with low sulfur, low Btu coal of the Western seams. It seems to me that by pairing the exploitation and transportation of both types of coal, blends under 2 percent of sulfur content can be obtained in most instances. How to do this is probably one of the most interesting questions to ask.

Senator **Percy**. Thank you very kindly. And finally, Mr. Kinoshita from Japan.

Mr. **Kinoshita**. Thank you, Mr. Chairman.

First of all, I would like to reconfirm that coal could provide the trigger to restore the economic mechanism and supply stability to the field of energy, because it gives free and competitive options which come from the availability of so many types of coal and sources of supply of this widely distributed and abundant resource. These options should be made viable through the vigorous technological innovation at all stages of the coal chain system.

Japan is one of the most active countries in seeking to realize international agreement and principles for shifting from oil to coal, with special consideration for a balanced approach, which includes nuclear power development to overcome its particular serious energy situation. The major steam coal use in the future of Japan is projected to be in electricity generation, as in the other countries, which is forecast to consume more than 70 percent of total steam coal by 1990.

Estimates of coal requirements in the electric market are strongly influenced by assumptions about the rate of growth of electricity demand and the expansion of nuclear power. In this projection, electricity is assumed to increase more or less at the rate of economic growth, taking into account progress in energy conservation and continued transformation of industrial structures. Here, our rate of economic growth, 4.5 percent annually, is taken between 1980 and the year 2000. And also, electricity GNP elasticities is taken 1.1. Nuclear power already plays a substantial role in electricity generation. However, there are several predictions as to whether it is possible to install all this nuclear capacity for the future.

Exxon forecasts 37 GW, the Institute of Energy Economics. 36 GW, and U.S. Interagency Coal Export Task Force, 20 GW, or 27 GW compared with the Government target, 51 GW, respectively, for 1990. And also, Exxon forecasts 75 GW, ICE, 54 GW to 68 GW, compared with WOCOL for 90 GW to 100 GW, respectively, for the year 2000. On the assumption of 36 GW for 1990 and 70 GW for the year 2000 in respect to nuclear capacity, Japan's need for steam coal would be arithmetically calculated to be 89 million Mtce for 1990, and 192 million Mtce for the year 2000, including the requirement for other industries. Then Japan will have to import 171 million Mtce for 1990 and 276 million Mtce for the year 2000, including metallurgical coal. A feedstock requirements for synfuel are not considered in these figures.

Of course, import-export trade regional patterns will be decided by factors such as the economics, security of supplies, condition of infrastructure, viability of competiveness, Government intervention, and so forth. Roughly one-third of the total import requirements will depend upon the United States. In this sense, it is no doubt very urgent to set up an overall scheme for coal transportation between the two countries.

Japan has been regarded as the most advanced country in developing environmental control. The important thing is, most of the environmental risks from coal use can be resolved by technological control. On the other hand, each increment of reduction increases the cost. So control costs are estimated at $16 per ton coal for 100 ppm emission, and $18 for 50 ppm emission. Especially in the case where coal with high sulfur content of more than around 3 percent is used, the costs jump discretely because dual FGD units must be prepared to meet the existing environmental requirements. Additional costs in this case would be approximately at $8 per ton.

Environmental problems are highly regional. The control measures differ by countries because of geographical, climatic, ecological, industrial circumstances, and social perceptions. Almost all local governments have independently enacted pollution control ordinances which are much more stringent compared with the national standards. The important thing is not to consider loosening the standards and regulations, but to overcome the environmental problem through technological improvement in order to effectively realize the coal objectives based on public acceptance.

In the case of coal from Illinois Basin to Japan, we can basically point out the advantage of relatively stable low costs for inland waterway transportation as well as high Btu content against the disadvantage of high ocean transportation costs and high sulfur content in comparison to Western coal. In particular, we believe it is important to bring up a variety of viable options and alternatives in order to fulfill the function of market competition.

A larger size of ship will be essentially required to increase the economies of scale in order to overcome the handicap of maritime transportation, if the new Panama Canal, which can accept more than 100,000 dwt, were opened, economic viability of coal to be shipped from the Gulf coast to Japan would be greatly increased.

In addition, more attention should be paid to characteristic of this supply region in terms of stability of transportation systems, based on an independent and competitive system which may contribute to an emergency case. And also, relatively competitive supply systems along the Mississippi, which can involve various sources in this region as well as competiveness of waterway transportation enterprise, would be noted.

Senator PERCY. Mr. Kinoshita, I hope you'll allow us to incorporate the rest of your statement in the record. Thank you so much. I would like to point out incidentally, how valuable I think the three suggestions you make in your statement are—creating a coal information system relating to Illinois Basin, initiating a study of the opportunities for large scale coal stockpile at the lower end of the Mississippi River, and exploring the potential for expansion of the Panama Canal. Three very valuable suggestions, and we appreciate them.

Mr. KINOSHITA. Thank you very much.

Senator PERCY. Mr. Chang, I'd like to begin this brief series of questions with you, if I may. Do you sense that a new spirit in being developed in this country toward coal exports now, a stronger spirit than you have seen before? Is there reason to hope that we have turned the tide and are ready to aggressively compete with anyone in the world for your coal import business?

Mr. CHANG. You mean the reliability of U.S. coal supply?

Senator PERCY. Yes.

Mr. **Chang**. Well, I think we have strong confidence in what you have to say, that the United States will honor what it speaks with foreign countries. We have had feelings in our country, and we depend on a lot of things from the United States, such as grain, for instance. And the next important thing which we will import from the United States will be energy. And we have confidence in the United States to the supply of energy in the future. So, we have no doubts that we will increase our trade relations with the United States in the supply of two most important commodities, which is food and energy.

Senator **Percy**. Thank you very much, Mr. Chang, that is a very reassuring statement.

Dr. Dominquez what promise do you see ahead for using high sulfur coal in Spain when it's blended with lower sulfur coals from Western or Eastern States, for instance? I am of course, particularly interested in my son-in-law's State of West Virginia.

Mr. **Dominquez**. Well, you know that met coal trade is made of blending processes. We have been, for many years, importers of met Polish and American coal, which are blends of different kinds of coal. So far, we have not had problems with this kind of coal. So, I understand that there would be no trouble in blending your coal with coal from other countries. No basic problems other than those of logistics and costs; how to handle coals from disparate sources, and in what measure their transportation may become a complicating factor in our trade with the United States are matters to be considered.

I am not in a position to comment too much about this point, but my feeling is that it depends on the American suppliers; you know that our intentions are not to deal with small suppliers, but with corporations able to supply a good share of the amount of coal that we need from this country. If these big suppliers are able to handle the Illinois coal, for instance, along, with coal from other sources, the final product has a competitive price, and it can be loaded on the ships upon their arrival, I don't see any problem in dealing with Illinois coal.

Senator **Percy**. Thank you very much.

Mr. Lee, turning to you: Do you have any serious doubt that this country can make an absolute commitment to serve as a reliable coal supplier? Do you feel that you can trust the United States to live up to any or all contractural obligations?

Mr. **Lee**. Yes, in principle, yes, I think we can trust you. Although, in our past experience, not much with bituminous coal, but we bought some anthracite coal in Pennsylvania, and I must say that we have had bits of trouble in getting an availability of the right kind of coal at the right moment, and I would hope that this kind of experience would not happen in the future, particularly in connection with bituminous coal.

Senator **Percy**. Thank you.

Mr. Daniels, could you comment on the possibilities that France has for additional deep water ports? How would you pay for those ports? When would you expect them to the completed?

Mr. **Daniels**. Well, the financing of the ports has already been earmarked by—either by the Government, or as very often in France as in conjunction of governmental effort and local effort of the local port authorities. And as to new ports, there's three, one definitely, which by the end of 1983 will be able to accommodate ships of up to 200,000 tons deadweight, another port is specially being built in Noyon for ships of 120,000 tons deadweight to supply two new coal fired units. And the third port is Fos which is, in fact, far from Marseille, which is being upgraded and—sorry, Noyon will be ready at the end of next year, and Fos is being upgraded and will be ready by the end of next year for ships of 120,000 tons. Not to forget that we already have existing facilities for ships up to 150,000 and 200,000 tons in Noyon and Fos. So I would say that France, in general, is pretty well geared, and is getting ready for larger ships.

Senator PERCY. Fine, thank you so much.

Mr. Kinoshita, because of your country's enormous concern for ecology, you have gone out of your way to see that the coal Japan burns is clean. What can the U.S. Government do to help the Japanese people develop an applied technology to enable your nation to burn more high sulfur coal for cement production, power generation and other industrial uses?

Mr. KINOSHITA. Yes, I think you are—fortunately, we have not a little experience in the field of antipollution at this moment. Japanese Government gives subsidies for R/DD aiming achievement of the total system for integrated environmental control for SO_x, NO_x and particulates. So in this field, we would have much more active and positive international cooperation between the United States and Japan, but the problem is, the attitude of the U.S. Government, because I understand the difference of economic structures between Japan and the United States, but it seems that the U.S. Government is not closely matched, and not actively involved in such kind of development activities. I think as one of the unsoothing activities, I feel the passive stance of the U.S. Government's cooperation, in such case—I mean that global expansion of coal use, involving a large scale of infrastructure development. Thank you.

Senator PERCY. Thank you, very much.

Again, I will be pleased to keep the record open for additional comments that you might make on all of the questions. I thank this panel very much. We are particularly grateful to you for the time you have taken to come to the State of Illinois. We hope that you have enjoyed your visit here and will continue to enjoy the conference.

Thank you.

[The prepared statements of Messrs. Chang, Lopez (submitted by Mr. Dominquez), Lee, Daniels, Faucounau (with an attachment), and Kinoshita follow. Responses to written questions submitted by Senator Percy to Messrs. Chang, Lee, Dominquez, and Kinoshita also follow:]

PREPARED STATAEMENT OF K. S. CHANG

A. FOREWORD

Energy is the impetus to social and economic development and its adequate supply is also essential to national security. The Republic of China on Taiwan has been one of the fastest economic growing nations in the world. Its economy continues to steadily improve in 1980 despite the influences of adverse international economic developments and oil price. The country's economic growth rate in 1980 reached 6.66 percent. The Gross National Product amounted to US$40.26 billion, resulting in an increase of 24.47 percent over the previous year. The national income this year was US$37.07 billion, which was an increase of 24.40 percent. The country's per capita income reached US$2,101, a 22.03 percent increase over 1979.

The two-way trade for the country reached US$39.50 billion in 1980, an increase of 27.9 percent over the previous year with favorable balance of US$46 million. The index of industrial production in 1980 reached 8.0 percent. This increased production can be traced to the greater emphases of technology and capital intensive industries in the Republic of China.

In 1980, the total energy consumption except 815,000 kl of oil equivalent for exports was 32 million kl of oil equivalent, resulting in an increase of 6.89 percent over the previous year.

Of the total, 28 million kl of oil equivalent, or 89.37 percent, were consumed as energy which was a 6.84 percent increase over 1979. To classify by forms of energy, coal and its products contributed 7.93 percent, which was 11.71 percent increase over 1979; petroleum products provided 42.70 percent, which was a 6.57 percent increase; natural gas shared 3.47 percent, which was 1.26 percent increase; electricity constituted 35.27 percent, marking an increase of 6.70 percent.

B. ENERGY POLICY

In order to guide the management and development of the energy industries to be compatible to the overall economic objectives, our government promulgated early in 1973 a comprehensive energy policy.

Events developed since then calls for revision of the policy with emphases on accelerated development of indigenous energy, strengthening energy conservation and further diversification of energy imports. The principal objectives of the energy policy are:

1. To assure adequate and reliable supplies of the various forms of energy needed to sustain economic growth;
2. To enforce energy-saving measures so as to enhance the effects of energy conservation;
3. To strengthen the exploration and exploitation of indigenous energy and to diversify the kinds and sources of energy imports so as to reduce the reliance on petroleum and to alleviate the impact of the possible shortage of oil supply on economic growth;
4. To assure reasonable energy prices and to encourage the reduction of the cost of energy;
5. To encourage the use of the nonconventional sources of energy such as geothermal, wind energy, solar energy and biomass energy.

C. TAIWAN POWER SYSTEM

a. *Existing System*

As of the end of 1980, Taiwan Power system had a total installed capacity of 9,056 Mw, of which 15 percent or 1,386 Mw is hydro, 60 percent or 5,418 Mw is oil, 980 Mw or 11 percent is coal and 1,272 Mw or 14 percent is nuclear.

The peak load in 1980 was 6,703 Mw, a 10.4 percent increase over the previous record. The average load was 4,646 Mw, a 7.4 percent increase over the previous year. The highest daily average load reached a record of 5,658 Mw.

Production.—Net energy production reached 40,813 Gwh during 1980, a 7.7 percent increase over the previous year. Hydro generation reached 2,905 Gwh, only accounting for 7.1 percent of the total, and a 36.1 percent decrease over the previous year. Thermal generation reached 30,096 Gwh, which was 73.7 percent of total generation, showing a 10.1 percent increase over the previous year. Nuclear power generation reached 7,812 Gwh, 19.2 percent of total generation, showing a 30.1 percent increase over the previous year.

b. *Load forecast*

In conjunction with the nation's economic development, the state-owned Taiwan Power Company (Taipower) having the responsibility of supplying electricity to all customers has completed the long-term load forecast for the next 15 years. The GNP growth rate as well as the load growth rate from 1980 through 1995 is shown in Table 1.

TABLE 1.—FORECAST LOAD GROWTH (1980-95)

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Peak load (megawatts)	6,703	7,529	8,429	3,388	10,417	11,470	12,606	13,807	15,105
Growth rate (percent)	10.4	12.3	12.0	11.4	11.0	10.1	9.9	9.5	9.4
Average load (megawatt)	4,646	5,251	5,806	6,401	7,047	7,716	8,450	9,229	10,083
Growth rate (percent)	7.4	13.0	10.6	10.2	10.1	9.5	9.5	9.2	9.3
GNP growth rate (percent)	6.7	8.0	8.0	8.0	8.0	7.8	7.8	7.8	7.8

	1989	1990	1991	1992	1993	1994	1995	1980-95[1]
Peak load (megawatt)	16,502	18,012	19,656	21,407	23,389	25,376	27,476	--------
Growth rate (percent)	9.2	9.2	9.1	8.9	8.9	8.9	8.3	9.66
Average load (megawatt)	11,012	12,045	13,130	14,276	15,524	16,893	18,246	--------
Growth rate (percent)	9.3	9.8	9.4	8.7	8.7	8.8	8.0	9.55
GNP growth rate (percent)	7.8	7.5	7.5	7.5	7.5	7.5	7.0	7.70

[1] Average annual growth rate.

c. *Expansion of power system*

In order to catch up with the ever-increasing power demand and the nation's economic development, Taipower has pursued a policy of energy supply diversification and cost reduction. Coal and nuclear are the alternative energy to oil for future power generation. According to the latest long-range power development program the total installed capacity for 1955 will be 33,619 Mw, including 14% or 4,670 Mw of hydro, 11% or 3,755 Mw of oil, 36% or 12,250 Mw of coal and 39% or 12,944 Mw of nuclear. The system installed capacity as well as the percentage of various generating capacities from 1981 through 1995 is shown in Table 2, from which it can be seen that emphasis will be put on development of both coal-fired and nuclear plants. Table 3 shows the component variation of generation energy from 1981 through 1995.

D. REQUIREMENT OF STEAM COAL

A. *Steam coal demand for electricity generation*

The requirement of steam-coal for the existing and additional coal-fired units is projected by using a power system operation simulation model with due considerations given to the quality and availability of coal, the characteristics of generating facilities the optimization of system operation, etc. Provisions for a transportation loss of 4% of total consumption and a stock change for maintaining a five-month inventory are also included in the projection. The specification for steam coal currently used for electricity generation is shown in Table 4.

TABLE 2.—SYSTEM INSTALLED CAPACITY

Year	Hydro		Coal		Oil		Nuclear		Tota
	Megawatts	Percent	Megawatts	Percent	Megawatts	Percent	Megawatts	Percent	Megawatts
1981	1,426	14	945	9	5,419	54	2,257	23	10,047[1]
1982	1,426	12	1,405	12	5,725	49	3,242	27	11,798
1983	1,493	12	1,905	16	5,725	46	3,242	26	12,365
1984	1,493	11	2,855	21	4,775	36	4,193	32	13,316
1985	2,243	14	4,115	26	4,307	27	5,144	33	15,809
1986	2,688	16	4,665	28	4,247	25	5,144	31	16,764
1987	2,688	15	5,765	32	4,247	24	5,144	29	17,844
1988	2,828	14	7,375	38	4,267	22	5,144	27	19,614
1989	3,476	16	7,925	36	4,267	20	6,044	28	21,712
1990	4,366	19	7,850	33	4,267	18	6,944	30	23,427
1991	4,670	18	8,275	33	4,267	17	8,144	32	25,356
1992	4,670	17	8,825	33	4,267	16	9,344	34	27,106
1993	4,670	16	9,250	32	4,267	15	10,544	37	28,731
1994	4,670	15	10,750	34	4,267	14	11,744	37	31,431
1995	4,670	14	12,250	36	3,755	11	12,944	39	33,619

TABLE 3.—COMPONENT VARIATION OF GENERATION ENERGY

	Hydro		Coal		Oil		Nuclear		Total
Year	Gwh	Percent	Gwh	Percent	Gwh	Percent	Gwh	Percent	Gwh
1981	4,519	9.8	6,447	14.0	27,233	59.2	7,770	16.9	45,969
1982	4,717	9.3	7,867	15.5	25,177	49.5	13,098	25.8	50,859
1983	4,715	8.4	11,255	20.1	22,560	40.2	17,535	31.3	56,075
1984	5,138	8.3	15,400	24.9	20,836	33.5	10,552	33.3	61,746
1985	5,137	7.6	22,060	32.5	14,978	22.1	25,[illegible]	37.9	67,879
1986	5,229	7.0	26,669	35.6	15,194	20.3	27,823	37.1	74,915
1987	6,072	7.4	31,780	38.9	16,005	19.6	27,823	34.0	81,750
1988	6,053	6.8	39,780	44.4	15,840	17.7	27,823	31.1	89,486
1989	6,486	6.6	48,124	48.3	15,172	15.5	27,823	28.5	97,095
1990	6,540	6.1	50,482	47.0	17,640	16.4	32,092	30.5	107,363
1991	7,019	6.0	52,181	44.5	15,727	13.4	42,452	36.2	117,379
1992	7,004	5.6	55,583	43.6	15,870	12.5	48,943	38.4	127,410
1993	7,004	5.1	59,406	43.0	16,305	11.8	55,436	40.1	138,349
1994	7,004	4.7	65,049	43.9	15,271	10.2	61,985	41.2	150,398
1995	7,004	4.4	72,485	44.7	14,199	8.8	68,436	42.2	162,169

TABLE 4.—SPECIFICATION FOR STEAM COAL

Item	Specification value
Heating value (Kcal kg)	6,200 minimum.
Volatile matter (percent)	24 minimum.
Ash content (percent)	19 maximum.
Total sulphur (percent)	1.5 maximum.
Grindability (H. G. I.)	50 minimum.
Ash-softening temperature (degrees Celsius) (under reducing condition)	1,200 minimum.
Size (m/m)	50 Maximum; 2 <(30 percent maximum).
Na_2O in ash (percent)	2 Maximum.

b. Steam coal demand for industries

The increasingly unreliable supply and spiraling price of imported oil have also encouraged those industries which may use coal as fuel to convert from oil and gas to coal. In 1980, cement industry, the second largest steam-coal consumer (next to electric utility) in Taiwan, consumed 0.81 million tons of steam coal which represented 35 percent of the total fuel requirement for industries, and the other industries, mainly plateglass, ceramics, chemical, coking, etc., consumed 1.54 million tons.

A general survey on steam coal demand for industries was made by means of individual interview with private industries. The projected future demand of steam coal for industries depends mainly upon their production plans and energy conservation programs.

c. Total demand for steam coal

According to the above projection, the total steam coal demand for both the electric utility and industry for the next 15 years is tabulated annually in Table 5. The total demand subtracting the anticipated supply of domestic coal is the coal quantity to be imported from world-wide coal sources.

TABLE 5.—PROJECTION ON STEAM—COAL DEMAND IN TAIWAN, 1981–95

[In millions of tons]

	Demand			Supply source	
Year	Electric utility	Industry	Total	Domestic	Imports
1981	2.9	3.0	5.9	2.6	3.3
1982	3.7	3.8	7.5	2.6	4.9
1983	5.2	4.6	9.8	2.6	7.2
1984	8.0	5.5	13.5	2.6	10.9
1985	10.7	5.9	16.6	2.6	14.0
1986	12.0	6.3	18.3	2.6	15.7
1987	14.3	6.8	21.1	2.6	18.5
1988	17.8	7.3	25.1	2.6	22.5
1989	21.1	7.8	28.9	2.6	26.3
1990	21.2	8.3	29.5	2.6	26.9
1991	21.7	8.8	30.5	2.6	27.9
1992	23.2	9.5	32.7	2.6	30.1
1993	24.8	10.1	34.9	2.6	32.3
1994	28.1	10.7	38.8	2.6	36.2
1995	30.9	11.4	42.3	2.6	39.7

E. STRATEGY FOR IMPORTATION OF COAL

a. Diversification of coal resources

The remaining coal reserve in Taiwan is estimated to be 200 million tons and the annual production in 1980 was 2.5 million tons of which only 0.6 million tons were made available for power generation. To make up the deficiency of coal supply, Taipower imported 3.0 million tons of coal in 1980 for power generation. Accordingly, steam coal will depend largely on importation.

The potential sources of coal for imports include Australia, South Africa, the United States, Canada, Indonesia, India and European countries. However, the former four countries are considered as the primary sources.

In view of potential uncertainties such as strikes in the mines and loading ports, insufficient berths and loading capacity, lead time needed to develop mines, insufficient inland and ocean transportation and national protectionism of natural resources, etc., diversification of coal supply from several countries is significantly necessary where a large coal importation program is involved. Therefore, spreading of purchases from several countries provides a measure of protection in case of disruption of deliveries from any one country.

Aside from diversification of coal sources, Taipower intends to purchase coal either on the basis of long-term contract or in the form of joint venture on development of coal mines so as to ensure coal quality and supply.

b. Ocean transportation

In accordance with the national policy of Chinese ships for Chinese cargo, Taipower plans to build major portion of the coal fleet required for ocean transportation. Three 125,000 DWT and six 63,000 DWT coal carriers have been contracted to the China Shipbuilding Company and will be made available to Taipower by 1985. More coal carriers will be built by stages in accordance with future coal requirement.

c. Domestic transportation

Cost for domestic transportation is one of the major factors affecting the coal cost. According to the local condition and economic consideration, the domestic transportation system can be classified into 3 types according to the distance between unloading terminal and power plant as given below:

Distance between unloading terminal and power plant	*Adopted facility*
Near by ($\leq$ 10 Km)	Conveyor-belt system.
Short Distance ($>$ 10 Km and $\leq$ 35 Km)	Truck/barge system.
Long Distance ($>$ 35 Km)	Railway.

d. Blending of coals

In view of the limited availability of low-sulfur coals and the successive addition of coal-fired units to the power system, blended coal would be considered for power generation. Coals can be well blended and successfully fired in any new unit that has been designed to fire such fuel. However, the complete knowledge of the quality of coal that is to be blended, the method and extent of blending and the expected range of properties of the blended coal have to be investigated before designing. Since the performance of blended coals cannot be entirely predicted by simple average of the properties or constituents of the makeup coal, it is required to perform laboratory tests in order to obtain the properties of the resultant blended coal.

According to the preliminary result of laboratory test for blending low-sulfur coal from Western sources with high-sulfur coal from Eastern sources at an 80:20 weight basis, the quality of such blended coal could meet the current specification for imported steam coal. However as far as sulfur content is concerned, it should not exceed 3 percent.

e. Contracted and negotiating coals

As described previously, Taipower being the largest user of steam coal has to import annually a large quantity of steam coal for electricity generation. In order to secure sufficient coal from abroad, Taipower has been actively seeking for coal sources. Up to date, a total of 32 million metric tons for 1981–1985 period has been contracted and a total of 17 million metric tons for the same period is still under negotiation. A breakdown of the contracted and negotiating coal by coal sources is summarized in Table 7.

TABLE 7.—CONTRACTED OR NEGOTIATING COAL

Year	Coal amount (1,000 tons)		Coal sources (percent)							
			United States		Australia		South Africa		Canada	
	A[1]	B[2]	A	B	A	B	A	B	A	B
1981	3,334	150	65.5	--------	18.0	--------	16.5	100.0	--------	--------
1982	3,345	600	65.6	--------	19.4	50.0	15.0	50.0	--------	--------
1983	4,510	900	61.2	--------	18.9	33.3	15.5	66.7	4.4	--------
1984	5,470	1,400	58.0	--------	15.5	57.1	16.4	42.9	9.1	--------
1985	6,970	1,350	48.4	--------	17.2	77.8	12.9	22.2	21.5	--------
1986	8,800	1,350	44.3	--------	15.9	77.8	5.7	22.2	34.1	--------
1987	9,300	1,400	47.3	--------	15.1	78.6	5.4	21.4	32.2	--------
1988	9,400	1,400	46.8	--------	16.0	78.6	5.3	21.4	31.9	--------
1989	9,900	1,400	49.5	--------	15.1	78.6	5.1	21.4	30.3	--------
1990	7,300	1,400	31.5	--------	13.7	78.6	6.8	21.4	48.0	--------
1991	5,000	1,400	20.0	--------	10.0	78.6	--------	21.4	70.0	--------
1992	5,000	1,400	20.0	--------	10.0	78.6	--------	21.4	70.0	--------
1993	5,000	1,100	20.0	--------	10.0	100.0	--------	--------	70.0	--------
1994	5,000	1,100	20.0	--------	10.0	100.0	--------	--------	70.0	--------
1995	4,000	1,100	--------	--------	12.5	100.0	--------	--------	87.5	--------
Total	92,329	17,450	40.7	--------	14.6	76.8	6.6	23.2	38.1	--------

[1] Contracted coal.
[2] Negotiating coal.

E. AMBIENT AIR QUALITY STANDARD

The Government of the Republic of China promulgated the AIR POLLUTION CONTROL ACT early in May 1975. This Act is enacted in order to prevent air pollution and protect public health.

The National Health Administration is charged with the responsibility of executing this Act. The Ambient Air Quality standards of this Act are presented in Table 8.

TABLE 8.—AMBIENT AIR QUALITY STANDARDS

Item	Interval	Ordinary area	Industrial area
I. Particulates:			
1. Suspended particulates (less than 10 um particle diameter).	Monthly average	210 ug/Nm³	240 ug/Nm³.
	Annual average	140 ug/Nm³	180 ug/Nm³.
2. Dust-fall (greater than 10 ug particle diameter).	Monthly average	200 ug/Nm³	250 ug/Nm³.
	Annual average	170 ug/Nm³	190 ug/Nm³.
II. SO_2:			
1. Concentration value	1-hr average	0.3 p/m	0.5 p/m.
	24-hr average	0.1 p/m	0.15 p/m.
	Annual arithmetic mean	0.05 p/m	0.075 p/m.
2. Accumulative value	100 cm²/30 days	60 mg (SO_3)	80 mg (SO_3).
III. NO_2:			
1. Concentration value	1-hr average	0.05 p/m	0.1 p/m.
2. Limitation: Allowed 35 days exceeding the limited value.			
VI. Stack emission rate:			
1. SO_2: 2,000 p/m.			
2. Particulates: 700 ug/Nm³.			
3. Smoked concentration:			
(1) Ordinary condition limited to Ringelmann No. 2.			
(2) Initial burning stage limited to Ringelmann No. 3, but it does not exceed an accumulative time of 3 min within 1 hr duration.			

Responses to Written Questions Submitted to Mr. Chang by Senator Percy

Question 1. A primary theme in the statement you presented to the Subcommittee in Carbondale was the need for reliability of supply. There have been some legitimate concerns about the United State's reliability as a coal supplier in the past. What is your perception of our country now?

Answer. The coal export policy statement made by your Secretary of Commerce Malcolm Baldrige on July 17, 1981 has enhanced our favorable consideration of importing coal from the United States. In other words, now we have much less concerns about the U.S. reliability as a coal supplier.

Question 2. Have you examined the geographical distinctions in the U.S. which might make coal exports from one part of our country more reliable than coal exports from another? I am speaking here specifically of the access which Midwestern coal has to the Mississippi and Ohio Rivers, to a superb rail system, and to the Port of New Orleans. Do you feel that these factors help to give Midwestern coal a "reliability edge" which may increase its exportability in the coming years? Explain.

Answer. Geographically speaking, coal exports from your western States to our country will cost us less with regard to transportation than those from your eastern or Midwestern States. Talking of the coal exports from Illinois with the access of Mississippi and Ohio Rivers, we share the observation that the inland waterway transportation is more cost competitive than other modes. The present congested situation in some eastern and southern U.S. ports, however, might have to be improved in order to strengthen the exportability and reliability of the coal produced in these States.

Question 3. Is there anything you believe the United States could do to help your country develop and apply technologies to burn more high-sulfur coal? What is your country doing on its own which may lead to the increased utilisation of higher-sulfur coal? Do you believe that there is a market for advanced coal-cleaning techniques (e.g., to maximize the types of coals which can be burned in your plants, and to commercialize these technologies elsewhere around the world)?

Answer. Many countries are developing technologies for applying high-sulfur coal or for purifying high-sulfur coal. We think that the United States could help us in this regard and believe there will be a market for advanced coal-cleaning technologies. At the moment we do not have a mature technology of our own except using the blended coal of high and low sulfur content.

Question 4. At the close of the Carbondale coal export conference, I announced that an Illinois coal company had signed a contract with a Spanish coal-purchasing agent, to provide that country with high-sulfur (1.8%) coal for cement manufacture. This contract is believed to be the first ever involving Illinois coal exports to Europe. What opportunities do you see for similar contracts between Illinois coal producers and coal purchasing agents or companies in your country?

Anwer. A supply contract for 55,000 metric tons of high sulfur coal was signed by the Peabody Coal Company and the Taiwan Power Company last month. Through the Taiwan Provincial Mineral Bureau I have also asked the cement industries in our country to consider the utilisation of high sulfur coal and I believe they will contact the Illinois coal producers if it is feasible.

PREPARED STATEMENT BY JOSÉ SIERRA LOPEZ, PRESIDENT OF CARBOEX, SUBMITTED BY GERMAN HERNANDOZ DOMINQUEZ

1. THE SPANISH ENERGY PROBLEM

Spain is now in the process of building-up a parliamentary and democratic political system, a task that would have been much easier within a framework of economic prosperity; but the effort of stabilizing our democratic system comes along with the need of readjusting our economy in the midst of an historical economic crisis that affects all the nations of the world. One of the most serious challenges we have to meet is how to decrease our dependence on imported oil without seriously impairing the wealth and prosperity of our country. Some figures will be helpful to understand the present situation of Spain from the viewpoint of energy supply and demand.

Spain, with a population of 37 million inhabitants and an energy consumption of 78 million BTU per person per year, is very far away from self-sufficiency because of the very important role played by oil, as the data in the following table point out; domestic wells supply only 3.5 percent of oil demand and, although Spain exports some refined products, our oil trade balance showed a deficit of 11 billion dollars in 1980, about 6 percent of our gross industrial product.

PRIMARY ENERGY CONSUMPTION IN SPAIN IN 1980

	Quads	M. TOE	Percentage
Hydropower	0.27	6,804	10.4
Nuclear	.04	1,079	1.6
Natural gas	.07	1,798	2.7
Coal	.54	13,504	20.6
Oil	1.68	42,375	64.7
Total	2.60	65,551	100.0

In relation with the world energy resources, Spain can consider itself well endowed with uranium, but not with fossil fuels; its fossil fuel resources represent about 0.3 percent of the world's total, while its gross domestic consumption represents about 1 percent.

In Spain, just like in most countries, coal was the major industrial development component, specially around the 1940s, but the increase in coal use ended during the 50s, although the substitution process was more drastic in Spain than in other European nations, and therefore, there is no other country in Europe—except Italy—as dependent on oil as Spain is.

In 1950, solid fuels were the most important energy source, accounting for almost three-fourths of the total consumption, followed by hydro. Oil did not even account for 10 percent of that total.

Coal's participation came down to 16 percent in 1978 from 74 percent in 1950, and been though energy demand more than doubled, coal use declined sharply during this period.

However, the adjustment to the impact of the energy crisis of 1973 and 1979 gave way to the recovery of the coal sector, and coal production increased from 14.2 metric tons in 1975 to 27 metric tons in 1980.

Coal's share of the total primary energy consumption in 1980 was 20.7 percent, but that of oil was 64.6 percent, and hydro was 10.4 percent only, although under medium hydraulic conditions hydro could have taken 3 more points away from oil.

The Spanish energy problem is, like in most western nations, how to shift from oil to alternative energy sources. The National Energy Plan for the 1978–1987 period foresees that oil will not even account for 50 percent of the total primary energy required during 1987. Towards this goal, the Plan intends to develop a wide nuclear power plant construction program, utilise the existing hydraulic resources to their maximum, increase national energy production and coal and gas consumption, and, in addition to all feasible energy conservation measures, to develop the use of new energy sources, especially solar.

This way, it is expected that of the total 3.7 quads to be required in 1987, coal will supply 23 percent, oil 49 percent, nuclear 11 percent, hydro 10 percent, and gas 7 percent.

2. STEAM COAL NEEDS

A structure of primary energy sources such as the one indicated above calls for extensive use of steam coal, which will be influenced by the following factors: scarce oil supplies and their price, changes of the time required to put nuclear power plants in service, the annual hydroelectric energy production, the country's energy needs, and the share of the market that coal can take in accordance with its price as compared with the price of oil.

Spain's future steam coal demand will basically come from three sectors. Electricity production, industry, and residential/commercial.

(a) The electricity sector: the current thermal power plant construction program is aimed at the addition of 6,882 MW during the 1980–1990 period, as well as the conversion from oil to coal of 2,141 MW currently installed.

Taking into account the installed capacity at the end of 1980 (about 6,500 MW) and the new plants to be built, coal would be used to generate 7,300 MW in 1983, 11,800 MW in 1985, and 12,800 MW in 1987.

(b) The industry sector, which includes an ongoing program for reconversion of the cement industry, will use about 2.7 million metric tons of coal from 1982.

Other studies are underway regarding the reconversion of the sugar and brick industries, which would use about 1 million metric tons per year.

(c) The residential/commercial sector: homes and non-residential, nonindustrial users consumed 1.3 million metric tons of coal in 1980, and they are ex-

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pected to use increasing amounts in the future in accordance with coal competitiveness and the impact of environmental protection regulations.

3. DEMAND OF IMPORTED STEAM COAL

To meet the short and medium-term needs of steam and metallurgical coal, the Spanish Coal Production Plan seeks to increase coal production from the 12 million tce, and 15.4 million tce in 1977 and 1980, respectively, to 18 million in 1985 and 20.6 million in 1987, but most of the additional production will be made of lignite.

These increases, however, are not enough to supply the expected demand growth; therefore, imports of steam coal will increase substantially, although the exact amounts to be imported yearly will depend on the evolution of domestic demand and production; so far, only the electricity production and cement manufacturing sectors have been considered in the assessment of imported coal needs; it is expected that domestic production will be sufficient to meet the demands from other sectors.

In the electricity generation sector, imported coal will either supply power plants that are being built for burning it, or will compensate for deficiencies in quality or quantity in plants burning domestic coal.

On the other hand, about 70 percent of existing cement manufacturing plants will shift from oil to imported coal because of their location; other plants will burn coal from mines in their area.

A total of about 10.6 million tce of steam coal will be imported in 1985 and distributed in the following way among the main consuming geographical regions:

Andalusia: 42 percent.
Catalonia and Aragon: 20 percent.
NW (Galicia, Asturias, Leon and Palentia): 32 percent.

The proportion will change slightly in 1987: 40, 25 and 25, with a total consumption of about 13–14 million tce.

4. COAL IMPORTS POLICY

4.1 Objectives and directives

Within the framework of its energy policy, Spain intends to reduce and diversify its dependence on oil, substituting part of it for imported coal.

The strategic character and the impact of this shift on the national economy requires to accomplish it under the best security and overall price conditions.

Due to the fact that sea freight affects the final cost in great proportion, it is necessary to design consistent marine transportation and port construction policies, along with a long-term policy of investments in coal production abroad.

The attainment of the above mentioned objectives will be evidently influenced by the existence of supply management agencies with a size and capabilities big enough to provide the required amounts of coal, within a free-market framework. Therefore, it is estimated that the minimum size needed to conciliate the diversification of sources and capital investment criteria must be of 5 million metric tons in 1985.

4.2 Imports

If the criteria for diversified supply sources and contract modalities are considered, a reasonable objective for 1990 could be:

Approximately 40 percent of imported coal should come from mines owned by corporations with a partnership of Spanish companies linked to long-term supply contracts for coal amounts exceeding Spanish participation, whenever possible.

40 percent more should come through long-term contracts, some of which could be linked to the above mentioned participations.

The remaining 20 percent would be available for short-term and spot purchases, or for financial-industrial long-term agreements payable with coal supplies.

In general terms, we feel that the long-term success of any agreement must be based on mutual confidence. We recognize that producers need to have a guarantee on the sale of their commodities at prices allowing a reasonable benefit over their costs, but we need long-term guaranteed supply and price stability.

4.3 Ocean transportation

Spanish coal purchases will be made on a F.O.B. basis; exporters will take care of freight management by using Spanish or foreign flag ships under free-market conditions.

In order to reduce shipping costs to a minimum, 125,000–150,000 DWT vessels are needed up to a total of 3.5 million DWT in 1987, to handle the 17 million metric tons of coal that will be imported.

4.4 *Ports and facilities*

To receive the coal to be imported since 1985, new terminals have to be built in Spain for fundamental reasons:

Current capacity of Spanish ports would not allow the handling of more than 4.5 million metric tons of imported steam coal per year.

The agreements with producing countries under relatively economic conditions imply the use of ships of 125,000–150,000 DWT, and existing Spanish ports are not deep enough.

Terminals will be built at the following locations:

Algeciras: to receive ships of more than 150,000 DWT; it will handle more than a million metric tons per year. A storage area will also be built.

Gijon: The Town Council is financing the construction of a new terminal with dredging for ships of 150,000 DWT. Unloading equipment will be installed to handle more than 12 million metric tons, 5 million of which will be steam coal.

Carboneras: A port to receive ships of 60,000 DWT will be built, with an unloading capacity of almost 3 million metric tons per year.

The investment required for the construction of these installations are estimated in 21,000 million Pesetas (1980 value). The installations are expected to start operations in 1984.

5. SOURCES OF COAL IMPORTS

Decisions on the origin of imported coal will depend on the following factors: Distance to coal producing countries, their own export capabilities, the availability of new ports both in Spain and abroad, stepwise increase of Spanish demand, as well as supply security.

All things considered, United States and South Africa will be the main suppliers in the next few years, while countries like Australia, Canada, Poland, Colombia and China will become more and more important in the following years.

Up to 1984, we will depend on the United States for 60 to 80 percent of our coal supplies. Then, the percentage will be reduced to 30 to 40 percent in favour of other countries like Australia (18–19 percent), Canada (5–13 percent), South Africa (14–12 percent), Poland, Soviet Union, China and Colombia.

6. SPANISH IMPORTING AGENTS

With the purpose of becoming an efficient agent capable of providing 40 to 50 percent of the total Spanish steam coal needs in a free-market environment, the National Institute of Industry-INI created Carboex (Sociedad Española de Carbon Exterior), which was incorporated on March 20, 1980.

In accordance with the above, Carboex expects to obtain a market for 6.5 million metric tons in 1985, and 11.1 million metric tons in 1990. Its main objectives are:

(a) 40 percent of the imports linked to long-term contracts.

(b) Minority participation in joint ventures overseas securing and additional 40 percent.

(c) Insure competitiveness of its supplies through capital investments in the ports of Algeciras, Gijon and Carboneras, and in other smaller terminals.

7. QUALITY

The following are the specifications of the coal needed by the cement manufacturing and electricity sectors:

Characteristics	Cement	Utilities
Moisture	8 percent maximum	8 percent maximum.
Ash	15 percent maximum	13 percent maximum.
Volatile	18 to 30 percent	24 percent minimum.
Caloric value	6,200 Kcal/Kgr minimum	6,500 Kcal/Kgr minimum.
Sulphur	2.5 percent maximum	1.5 percent maximum.
Hardgrove	55 minimum	55 minimum.
Ash fusion	1,350 Gr. C. maximum	1,350 Gr. C. minimum.
Size	0 to 55 mm	0 to 55 mm.

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Current Spanish regulations (Decree 833/1975 of February 6; Annex 4, Section 1.1) establish the following emission standards applicable to thermal power plants burning coal with a maximum of 1.5 percent sulphur and 20 percent ash: solid particular, 150 mg/Nm^3; SO_2, 2,400 mg/Nm^3.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO MR. DOMINQUEZ BY SENATOR PERCY

Question 1. A primary theme in the statement you presented to the Subcommittee in Carbondale was the need for reliability of supply. There have been some legitimate concerns about the United States' reliability as a coal supplier in the past. What is your perception of our country now?

Answer. In my opinion, the United States will be an important coal supplier in the future, due to its coal reserves and its capability to increase production as required by domestic and foreign demand growth. However, reliability appreciation abroad would increase substantially if assurances were given by the appropriate Authorities that a prompt solution will be given to the harbours problem.

Question 2. Have you examined the geographical distinctions in the U.S. which might make coal exports from one part of our country more reliable than coal exports from another? I am speaking here specifically of the access which Midwestern coal has to the Mississippi and Ohio Rivers, to a superb rail system, and to the Port of New Orleans. Do you feel that these factors help to give Midwestern coal a "reliability edge" which may increase its exportability in the coming years? Explain

Answer. Good transportation and easy access to the ports will undoubtedly improve the exportability of Western coal, because it will lower both the FOB and CIF sale prices.

Question 3. While it was not specifically mentioned in your testimony, I understand that a great deal of promise lies in your country's utilities and industries using high-sulfur coal which has been blended with lower-sulfur coals from the Western or Eastern United States. Can you describe the possibilities which you see for blending high-sulfur coal/low-sulfur coal for use in your country? What are the specifications these blends would have to meet to be considered for purchase?

Answer. As indicated in the paper I read in Carbondale, Spain will be mostly interested in low-sulfur coal for the electric utilities, where in some cases imported coal is blended with domestic high-sulfur coal. This quality of coal is not as important in the cement manufacturing industry because of the reaction of this element with other clinker components. The table of specifications included in the paper I presented refers to coal characteristics before utilization, except for size.

Question 4. I know that some countries of the world build deep-water ports specifically to handle coal imports for utilities built near the sea. Minister Chang mentioned in Carbondale his country's plans to do exactly that. Could you describe your country's current plans to build deep-water ports, how those ports are likely to be paid for, and when those ports are expected to be completed?

Answer. Construction and expansion projects are underway in Gijon, Algeciras and Carboneras, and the companies in charge have already been created, as follows:

Port/terminal	Company in charge	Expected date of operation
Gijon	Promosol	1983-84
Algeciras	Gibraltar-Intercar, S.A.	1984-85
Carboneras	Pucarsa	1984-85

Question 5 Is there anything you believe the United States could do to help your country develop and apply technologies to burn more high-sulfur coal? What is your country doing on its own in the way of technology research which may lead to the increased utilization of higher-sulfur coal? Do you believe that there is a market for advanced coal-cleaning technologies (e.g., to maximize the types of coals which can be burned in your plants, and to commercialize these technologies elsewhere around the world)?

Answer. There are no specific technology research projects underway to increase the utilization of high-sulfur coal. There is, however, a project to build a fluidized-bed combustion pilot plant.

Advanced coal-cleaning technologies do not have a wide market in Spain at this time; the main tendency is to blend low-quality domestic coal with high-quality imports.

PREPARED STATEMENT OF BONG SUH LEE

Mr. Chairman, Honorable Senator Percy: It is a great pleasure for me to have this opportunity today in this High Sulfur Coal Exports Senate Hearing & Conference as a representative of the Republic of Korea.

Within the limited time available, I would like to focus my presentation mainly to the prospects for high sulfur coal import to Korea.

In 1980 total consumption of energy amounted to 38 million tons of oil equivalent (toe). Petroleum accounted for 62 percent and anthracite 26 percent. Firewood, nuclear, hydro, liquified petroleum gas and bituminous coal make up the balance.

By 1986 the energy consumption is expected to increase to 59 million toe. With this increase, the configuration of energy supply sources will change significantly. Petroleum dependency is expected to decline markedly from the current 62 percent to 48 percent due to rising substitution of alternative sources such as coal, gas and nuclear energy.

Demand for coal is expected to increase to 43 million metric tons (mmt) in 1986 from the 1981 level of consumption of 30 mmt. Of the 30 mmt of coal consumed at present, 22 mmt is anthracite and more than 90% of its requirement is met by domestic production. The demand for anthracite for the next five years is expected to increase only at a moderate rate.

More than two-thirds of the 13 million ton increase in demand for coal in the next 5 years is attributable to a greater use of bituminous coal, particularly in the fields of power generation (4 mmt) and cement manufacturing (3 mmt).

Furthermore, it is forecasted that the steam coal requirement alone in the year 1991 will reach 12 mmt per year.

The following is a detailed description of the new-demand for steam coal for 1991 in Korea.

POWER GENERATION

Plant location	Expected completion date	Power units (megawatts)	Coal consumption (million metric tons)
Gojung	1984	1.000	2
Samchunpo	1985	1.000	2
Location undecided	1991	2.000	4
System conversion	1991		1
Cement manufacturing	1982		3
Total	1991		12

At the present time we have two coal-fired plant projects under construction. Each project has two 500 megawatt plants. Both projects are to be operational by the middle of 1980's.

We have already signed contracts with companies from Australia and Canada to supply 4 million tons of coal per year to Korea.

For an additional 1 million tons, we are now negotiating with several firms from Australia, Canada and the United States.

The future outlook for the demand for steam coal is derived from both the construction of new coal plants and the conversion of existing plants by substituting coal for oil. However, the non-availability of bituminous coal in Korea necessitates the import of all required amount of steam coal; hence reliance must be placed on the importing of steam coal from various countries in due course, certainly including the U.S. in the very near future.

However, I would like to express some of the probable barriers we may encounter by importing U.S. coal, particularly high sulfur steam coal.

First: The Environmental Protection Regulation in Korea presently imposes a regulation that requires the emission level of sulfur oxides to be below 1,800 ppm.

Second: Currently, the price of U.S. coal is not competitive in the Korean market. In 1981, for instance coal from Australia and Canada is being negotiated at about $50.00 per ton, F.O.B. The price of U.S. coal is about $7.00 higher per ton, F.O.B. In addition to this higher cost, longer shipping distances would raise transportation costs by about $3.00 per ton.

Third: We are considering at this time the implications of entering into any long term contracts involving the importing of U.S. coal. This is due mainly to the possibility that U.S. ports could not adequately facilitate the increased coal movement from the U.S. to Korea.

Even after considering these possible problems with importing U.S. coal, I still maintain optimistic views concerning the utilization of U.S. coal in Korea's near future.

First, I believe that there is ample possibility of utilizing high sulfur coal in Korea. This can be achieved by either blending coals of different sulfur content with U.S. coal or by relaxing the sulfur oxide emission regulation. In the near future, we will study the possibility of relaxing the sulfur contents regulations particularly on the power generation plants located in the coastal zones.

Second, although the price of U.S. coal is still high in the Korean market as I have mentioned, the gap between U.S. coal prices and other competing coal prices is narrowing. This is due to the rapid increases in prices of both Australian and Canadian coal. More specifically, the U.S. coal prices were approximately 30 percent higher than Australian and Canadian coal in 1979. Currently, the price differential has been reduced to less than 20 percent.

Third, Korea has been relying mainly on Australia and Canada for importing coal. Korea is now actively searching for U.S. coal for diversifying the source of coal supply for a variety of reasons. This includes uncertainty of delivery caused by labor strikes and congestion in both Australia and Canada.

If U.S. counterparts become more aggressive in expanding markets and in maintaining a "negotiation spirit", I firmly believe that there is ample possibility of opening a new coal market in Korea.

Today's conference certainly is a material proof of such an effort by the United States. I may also note a similar effort exerted by the governors' office of 12 western States (i.e. WESTPO) in proposing a joint study, financed by potential exporters and importers, in order to explore the possibility of promoting the use of western states' coal in the Far East. The Korean government is in full support of such a proposal and has decided in principle to contribute our share of the research fund.

We are equally interested in the future prospect of importing U.S. high sulfur coal and will be an active participant to any such suggestions that will ensure a stable supply of coal at a reasonable price in our part of the world.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO MR. LEE BY SENATOR PERCY

Question 1. A primary theme in the statement you presented to the Subcommittee in Carbondale was the need for reliability of supply. There have been some legitimate concerns about the United State's reliability as a coal supplier in the past. What is your perception of our country now?

Answer. We have always believed the U.S. can be a reliable source of supply once long-term purchase contracts are entered into. This is so despite some quality problems we have experienced in connection with anthracite coal purchases from an eastern state.

Question 2. Have you examined the geographical distinctions in the U.S. which might make coal exports from one part of our country more reliable than coal exports from another? I am speaking here specifically of the access which Midwestern coal has to the Mississippi and Ohio Rivers, to a superb rail system, and to the Port of New Orleans. Do you feel that these factors help to give Midwestern coal a "reliability edge" which may increase its exportability in the coming years? Explain.

Answer. Present congestions at the Long Beach port makes it advantageous to use the New Orleans port. On the other hand, the size limitation of the Panamex vessels from New Orleans will increase the transport cost.

Question 3. While it was not specifically mentioned in your testimony, I understand that a great deal of promise lies in your country's utilities and industries using high-sulfur coal which has been blended with lower-sulfur coal from the Western or Eastern United States. Can you describe the possibilities which you see for blending high-sulfur coal/low sulfur coal for use in your country? What are the specifications these blends would have to meet to be considered for purchase?

Answer. Until we know pollution problems with actual operation of coal-fired power units, we will not be in a position to specify an appropriate blending ratio between high and low sulfur coals. But our coal-fired power units are all located at the coastal areas; hence pollution problems may actually turn out to be less of a problem than we have originally anticipated.

Question 4. I know that some countries of the world build deep-water ports specifically to handle coal imports for utilities built near the sea. Minister Chang mentioned in Carbondale his country's plans to do exactly that. Could you describe your country's current plans to build deep-water ports, how those ports are likely to be paid for, and when those ports are expected to be completed?

Answer. All our coal-fired power units will be built along coastal areas and will have their own port facilities for coal import with an adequate depth to accomodate 100,000 ton capacity vessels. And these ports are built as an integral part of power station project, therefore, the utility company, the Korea Electric Company, finances the construction of the port.

Question 5. Is there anything you believe the United States could do to help your country develop and apply technologies to burn more high-sulfur coal? What is your country doing on its own in the way of technology research which may lead to the increased utilization of higher-sulfur coal? Do you believe that there is a market for advanced coal-cleaning technologies (e.g., to maximize the types of coals which can be burned in your plants, and to commercialize these technologies elsewhere around the world)?

Answer. We do not at present have an independent research program for use of high-sulfur coal. This will become an issue when we gather pollution data in the course of actual operation of coal-fired power units starting from 1983. Technological assistance from U.S. then may become necessary.

Question 6. At the close of the Carbondale coal export conference, I announced that an Illinois coal company had signed a contract with a Spanish coal-purchasing agent to provide that country with high-sulfur (1.8%) coal for cement manufacture. This contract is believed to be the first ever involving Illinois coal exports to Europe. What opportunities do you see for similar contracts between Illinois coal producers and coal purchasing agents or companies in your country?

Answer. We have a cement industry with a total production capacity of some 20,000,000 tons, and almost entire kilns will be converted from oil to coal use by the end of 1981. Until now, practically all the required coal is bought at the spot market. If high-sulfur coal from the Illinois basin is competitive in price, there will definitely be demand for it in our cement industry.

PREPARED STATEMENT OF WILLEM G. M. DANIELS

Mr. Chairman, Thank you very much for having called once more upon my association for delivering a testimony, this time aimed at exploring the use of American high sulfur coals in France.

Before touching the subject, I would like to mention that the future French Government, I mean the one France shall have in July next, will probably lay a greater emphasis on the use of coal than the outgoing one. My indication is based on the program of the Socialist Party which heretofore has set an objective by 1990 of a total consumption of 65 million tons to be supplied by a domestic production of 30 million tons and 35 of imports. You will remember that in Baltimore on April 28, when testifying before Senator Mathias, the figures I gave were respectively 50 million tons of consumption, with a national production of 10 to 15 and imports of 35 to 40 million tons. The emphasis is thus laid on a greater national production with imports more or less remaining at today's level.

1. WHAT IS HIGH SULFUR STEAM COAL FOR FRANCE?

The sulfur content of the French domestic coals being maximum 1.8 percent you will not be surprised to hear that for the French end-users high sulfur coal is any coal of 11,000 BTU exceeding 1.8 percent sulfur which means 3.3 lbs of SO2 per one million BTU. This is more or less the present yardstick. However, in a number of limited cases, this ceiling is being relaxed but only on the basis of a

BTU related content but in no case above the 2 percent for 12,000 BTU, i.e. again the 3.3 lbs of sulfur per million BTU.

2. THE DAY-TO-DAY SITUATION

2.1 Utilities

Since no scrubbers are installed (only ash precipitators) the utilities adhere very strictly to the 1.8 percent ceiling although stringent regulations strangely enough do not exist. The utilities are therefore in a way buying under a self-discipline constraint. For 1981 we to-day have about 7 million tons bought.

2.2 Cement mills, general industry and urban heating

The bracket these consummers are looking for is 1.5 to 1.8 percent but some of them are asking for a sulfur content as low as 1 percent for technical reasons. For 1981 we have about 1 million tons of coal under contract for this category of clients.

3. THE FUTURE

3.1 Utilities

No change expected in the basic requirements however, we are currently looking into the possibility of buying mixes (we would not really call it blends) of high and low sulfur coals, provided the volatile content of each component does not differ by more than 2 to 3 percent. This requirement is of great importance since a larger difference of volatiles in a mix which is not strictly homogeneous may create serious combustion problems. We are presently studying such possibilities out of New Orleans, but it must be realized that such a mix would certainly not have the homogeneity of an East Coast blend.

3.2 Cement mills

For the moment we can expect a change of attitude to come from the cement works. I think that in September next we may know more about the possibility of burning coals with 2.3 to 2.5 percent content. The point is that the cement mills have converted themselves from the humid to the dry process in order to save energy. Under the old humid process 3/3.5 percent sulfur was not a problem.

3.3 General industry and fluidized bed combustion

So far not much has been done on the subject with today's availability of French and foreign coals with a low sulfur content. However, one maker already markets a high temperature fluidised bed boiler. But in France as elsewhere in the world, there are no fluidised bed boilers in operation with low temperatures. I am glad to report that a leading boiler constructor has just requested us to ship as soon as possible a 4-ton sample in order to carry out tests under atmospheric pressure.

3.4 Synfuels

The top limit of sulfur will be much higher (3 to 4 percent) when using coal for gasification or methanol purposes. There are a number of projects under consideration. The one which is currently mentioned is the Gaz de France gasification pilot plant which would use 1000 tons of coal per day. In case of success other units might be built and require a total of 3 million tons of coal by 1990.

Regarding methanol plants either in France or to be built in the USA by French interests, I am unfortunately not in a position to give any information since these projects are still at a very early planning stage.

Mr. Chairman, this is the brief statement I wanted to deliver to you and your Subcommittee.

Thank you for having listened to me.

PREPARED STATEMENT OF JEAN FAUCOUNAU

SOME REMARKS ON HIGH-SULFUR COAL EXPORTS

As my friend, Willem Daniels from the ATIC, has given you the planned French coal consumption over the next few years and the main remarks about the use in France of high-sulfur coal, I feel free to make some free-lance remarks on the subject:

First, it would be an error to believe that the French industrialists—and more generally the European industralists—will use steam coal with more sulfur content than the United States.

The 2 percent sulfur content will be in the future, like in the United States, the generally accepted limit for ground pollution reasons. Some industries like the cement's, will use coal with some higher sulfur content (2.5 percent for instance). But on the other hand, lower sulfur content will be required in some pollution-sensitive areas.

Second, it would be a nonsense to believe that high-sulfur coal will not develop. I would like here to tell you a French story: In 1956, oilmen struck a vast reserve of natural gas in the Southwest of France near the small town of Lacq. Las! this gas had the following composition (in volume): CO_2, 9.6 percent; CH_4, 69.6 percent; C_2H_6, 3.10 percent; H_2S, 15.30 percent.

Everyone thought that it was unsuitable for use. One year after, the SNPA had adapted the old Clause Sulfur Converter Process in such a way that not only around 7.5 billions of cubic meter/year has been sold from 1957 to today, but around 1.7 to 1.8 MT of sulfur/year, as a by-product, have made France the main sulfur producer in Europe.

The key has been technology.

It is my firm belief that this is also the key for high-sulfur coal.

Two main ways, in my opinion, seem to be opened: desulfurization of the coal on the site, with transformation of coal into a more calorific fuel; or a desulfurization at the boiler.

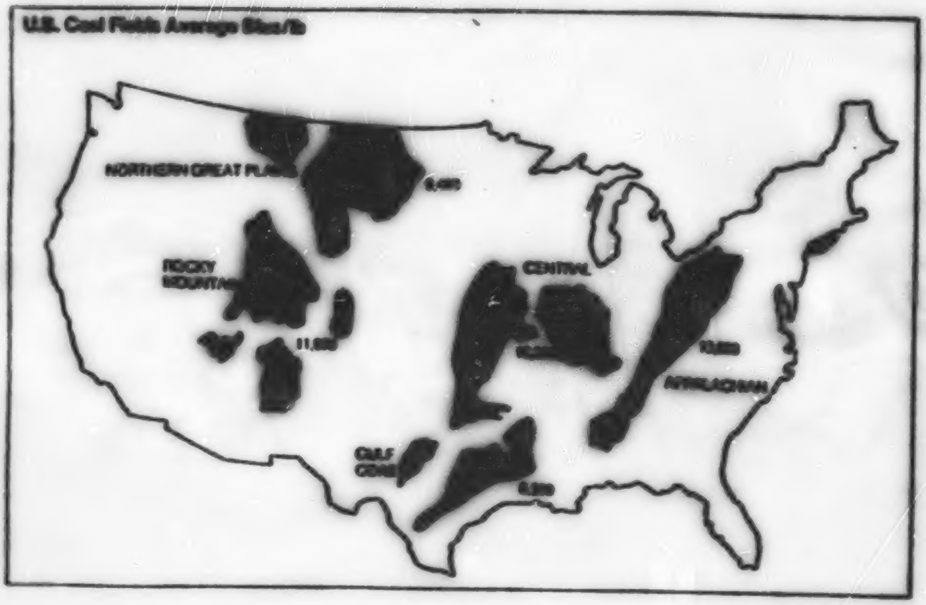
Concerning the first process, I would like to cite the Swedish Carbogel System, for instance, as a new line of research.

Concerning the last process, the research of the Argonne National Laboratory—to cite one of them—offers the promise of a brand new technology allowing to burn coal with a 3.5 percent sulfur content without environment risk.

A third idea I would like to express is about the kind of complementarity which exists between the high sulfur—high Btu coal of the Midwest and Central areas with the low-sulfur—low BTU coal of the Western seams. It seems to me that by pairing the exploitation and transportation of both types of coal, blends under 2% of sulfur content can be obtained in most instances.

How to do it, is probably one of the most interesting question.

Thank you very much for your attention.



U.S. Coal Fields Average Btus/lb

NORTHERN GREAT PLAINS
ROCKY MOUNTAIN
CENTRAL
APPALACHIAN
GULF COAST

CONGRESSIONAL RESEARCH SERVICE,
THE LIBRARY OF CONGRESS,
Washington, D.C.

TRANSLATION (FRENCH)

FRENCH COAL MINES,
PUBLIC ESTABLISHMENT OF AN INDUSTRIAL
AND BUSINESS NATURE,
Paris, September 28, 1981.

Hon. CHARLES H. PERCY,
U.S. Senator, U.S. Senate, Committee on Government Affairs, Washington, D.C.

DEAR SENATOR: In your letter of August 19, 1981, you consulted me, as well as Mr. Sore, Deputy Director General of the French Coal Mines, about the French environmental regulations insofar as the use of coal is concerned.

For this purpose, I am enclosing a summarized text dealing with the main criteria in the field of atmospheric pollution as well as the essential decree on equipment and the exploitation of thermal installations (of June 20, 1975 with a circular letter on implementation). At present we intend, within the ministries concerned, to adjust the restrictions imposed on ponderal indices for some categories of furnaces in favor of coal use.

The transportation of solid fuels, outside the mining establishments, is not subject to specific legislation and its development should not encounter special difficulties.

With respect to the investment overcosts which are caused by conforming to environmental standards, they can in general be estimated at 5 to 15 percent of the final costs according to the case. On this matter, I am also sending you a short excerpt from the French national report for the "World Coal Study."

On your part, would you be so kind as to indicate to us the extent of environmental encumbrances (sulphur content, ashes, transportation. . .) in the final stage of energy production in the United States, individually for each item, separating coal which interests us first of all. In other words, are the costs relatively higher for coal and will there be any relaxation of the total regulations in this field, as being pushed by the government intent statements?

I hope that these data will meet your concern and I remain at your disposal for any additional information.

With my best wishes, Senator, I remain
Sincerely yours

M. IPPOLITO,
Head of the "Foreign Community" Service.

MINISTRY OF INDUSTRY AND RESEARCH

EQUIPMENT AND OPERATION OF THERMAL INSTALLATIONS WITH THE INTENT TO REDUCE ATMOSPHERIC POLLUTION AND SAVE ENERGY

The Minister of Equipment, the Minister of Quality of Life, the Minister of Health and the Minister of Industry and Research;

Considering Decree No. 74-306 of April 10, 1974, modifying Decree No. 69-596 by the Minister of Health and the Minister of Industry and Research, of June 14, 1969, fixing the general rules for the construction of apartment buildings;

Considering Decree No. 74-415 of May 13, 1974 with respect to controlling polluting emissions into the atmosphere and some uses of thermal energy, and namely its article No. 9;

Considering the view of the Consultative Committee on the Use of Energy;

Decree:

Art. 1.—The provisions of the present decree shall apply to all combustion installations exceeding the capacity of 75 thermal units per hour (th/h), using commercial fuels and operating generators of steam, hot water, superheated water, hot air or of other heat conveying fluids.

Gas turbines, fixed Diesel motors, industrial furnaces, torches and urban or industrial waste treatment plants shall be expressly excluded from this decree.

Art. 2.—For the implementation of the present decree, the capacity of a generator shall be defined as the fuel quantity, expressed in lesser calorific power, consumed per hour in a continuous maximum operation. In the case where this capacity is not explicitly indicated by the constructor or fitter, it shall be regarded equal to 125 percent of the nominal capacity of the generators indicated by the constructor.

The capacity of an installation is the sum of the capacities of the generators that compose it.

The operation or non-operation of a generator shall be defined as the operation in which the generator is functioning at its nominal pace or is idle.

The continuous operation of a generator shall be defined as the operation in which the fuel quantity used per hour is never lower than that which corresponds to 66 percent of the nominal pace of the generator.

The modulated operation of a generator shall be defined as the operation in which the quantity of fuel used per hour may be less than that amounting to 66 percent of the nominal pace of the generator, without the generator being idle at any time.

Art. 3.—The boiler-house is a building sheltering the engines of heat production by direct combustion.

The emission velocity of gas combustion is the ratio of the gas combustion outflow at the point of the smoke duct at its opening into the atmosphere.

The level of reference for the evaluation of the altitude is the medium soil level at the point where the projected smoke duct is installed.

TITLE I.—EQUIPMENT AND INSTALLATION GENERATORS

Art. 4.—Articles 5 to 9 hereafter indicate the fire adjustment and control devices with which each generator or each installation shall be equipped in accordance with its capacity.

Art. 5.—With the exception foreseen in article 9, every generator whose capacity is equal or higher than 500 thermal units per hour and less than 1,000 thermal units per hour shall be equipped with a vacuum gauge indicator when its operation is not automatic and with a manual apparatus for measuring the blackening index.

Art. 6.—With the exception foreseen in article 9, every generator whose capacity is equal to or higher than 1,000 thermal units per hour and less than 3,000 thermal units per hour shall be equipped with the following devices:

(a) A vacuum gauge indicator;

(b) A device indicating the temperature of gas combustion at the exit from the generator;

(c) Manual measuring device for indicating the blackening index;

(d) A device indicating either the fuel outflow or the outflow of the heat conveying fluid;

(e) A device indicating the thermal parameters of the heat conveying fluid at the entry and at the exit of the generator;

(f) A portable analyzer of gas combustion indicating at least the carbon dioxide content or any equivalent indication.

Art. 7.—With the exception foreseen in article 9, any generator whose capacity is equal to or higher than 3,000 thermal units per hour shall be equipped with the following devices:

(a) A vacuum gauge recorder

(b) A device indicating the temperature of the gas combustion at the exit from the generator.

(c) 1. In the case of steam generators: a steam pressure recorder at the exit header;

2. In the case of other generators:

A fluid temperature detector at the entry and the exit of the boiler-house;

A device indicating the thermal parameters of the heat conveying fluid at the entry and the exit of each generator;

(d) A device for continuous direct or indirect measuring of the blackening index.

(e) A device indicating either the outflow of the fuel, or the outflow of the heat conveying fluid.

(f) an automatic gas combustion analyzer indicating at least the carbon dioxide content or any equivalent indication.

In addition, any generator whose capacity is equal to or higher than 8,000 thermal units per hour shall be equipped with a device for measuring continuously, directly or indirectly, the quantity of dust particules emitted into the atmosphere.

Art. 8.—With the exception foreseen in article 9, any boiler-house equipped with generators of unitary capacity less than 500 thermal units per hour, but whose totality of generators has the capacity for higher than 1,000 thermal units per hour, shall be equipped with a manual device for measuring the blackening index.

Any boiler-house equipped with generators operating on heavy fuel oil shall be equipped with at least a portable viscometer.

Art. 9.—(1) When several generators are placed in the same boiler-house, one gas combustion portable analyzer may be used jointely for these generators.

When several generators have outlets into one common main, the temperature recorder, in the case of warm water generators or other fluid heat conveyors, may be commonly used for these generators.

When several generators have outlets into one common main, a device making it possible to isolate any idle generator from the main shall be foreseen.

(2) Generators whose furnace is in a highly pressurized state do not need a vacuum gauge meter.

(3) The generators which use only gas fuels or pulverized coal as fuel do not need devices for measuring the blackening index.

(4) The generators which use only gas as fuel are exempted from ponderal measuring of dust quantities emitted into the atmosphere.

Art. 10—The devices alluded to in articles 5 to 8 which shall be installed as of January 1, 1978 shall be approved by the Ministry of Industry and Research.

Art. 11.—In order to make it possible to control dust emissions alluded to in article 7 of the present decree, sealable and easily accessible devices shall be foreseen for each evacuation duct of the gas combustion at a place making it possible to undertake sampling measures of dust emissions into the atmosphere.

Art. 12.—Construction and equipment specifications for boiler-houses shall allow a good dispersion of combustion gases in such a way as to not create pollutants resulting from combustion in areas accessible to the population and namely sulphur dioxide, likely to exceed the maximum admissible levels. These specifications shall be determined on the one hand in terms of the capacity of thermal installations and of the nature of fuel and on the other hand in terms of the existence of obstacles likely to hamper the dispersion of combustion gases.

Art. 13.—The shape of the smoke duct, namely at the part nearest to the outlet into the atmosphere, shall be conceived in such a way as to facilitate to the highest degree the rising of the combustion gases into the atmosphere.

Art. 14.—For boiler-houses whose total capacity of thermal installations in operation is higher than 200,000 thermal units per hour, the smoke ducts shall require special study.

For boiler-houses whose total thermal installation capacity is higher than 75 thermal units per hour, the height of the outlet into the free air of the smoke ducts shall be at least the highest hp and Ho values defined as follows: hp shall be computed in accordance with the method explained in article 6; Ho shall be determined in accordance with the method explained in article 17 starting from parameters hs, hp and hi as defined in articles 15 to 17, under reservation, as the case may be, of exceptions foreseen in article 17.

Art. 15.—The hs value expressed in meters is chosen in the charts below in terms of boiler-house capacity and of the vertical rising velocity of emission at the outlet in the atmosphere of each duct, in the operating conditions corresponding to the nominal capacity of the smallest capacity generator flowing alone in this duct.

(1) SULPHUR CONTENTS IN FUEL LOWER THAN OR EQUAL TO 0.1 G/TH PCI

Power in thermal units per hour		Vertical ascending emission speed in meters per second					
Higher than—	Lower or equal to—	2	3	4	5	6	≥7
75	150	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2
150	500	2	1, 2	1, 2	1, 2	1, 2	1, 2
500	1,000	3	2	2	2	2	2
1,000	2,000	4	3	2	2	2	2
2,000	3,000	5	4	3	2	2	2
3,000	5,000	6	5	4	3	2	2
5,000	8,000	7	6	5	4	3	2
8,000	-----	8	7	6	5	4	3

The vertical ascending velocity of emissions shall be at least 2 meters per second for generators in full operation or idle; 3 meters per second for generators in continuous operation; 4 meters per second for generators in modulated operation.

For the atmospheric burners using gas fuels this velocity may be only 0.8 meter per second whatever the operating method.

(2) SULPHUR CONTENT IN FUEL HIGHER THAN 0.1 G/TH PCI OR LOWER THAN OR EQUAL TO 1 G/TH PCI

Power in thermal units per hour		Vertical ascending emission speed in meters per second						
Higher than—	Lower or equal to—	2	3	4	5	6	7	≥8
75	150	2	1,2	1,2	1,2	1,2	1,2	1,2
150	500	3	2	2	2	2	2	2
500	1,000	4	3	2	2	2	2	2
1,000	2,000	5	4	3	2	2	2	2
2,000	3,000	6	5	4	3	2	2	2
3,000	5,000	7	6	5	4	3	2	2
5,000	8,000	8	7	6	5	4	3	2
8,000	----------	----------	8	7	6	5	4	3

The vertical ascending emission velocity shall be at least 2 meters per second for the generator operating at full capacity or idle whose capacity is less than 8,000 thermal units per hour; 3 meters per second for generators operating at full capacity or idle whose capacity is higher than 8,000 thermal units per hour as well as the generators operating continuously; 6 meters per second for the generators operating at modulated pace.

(3) SULFUR CONTENTS IN FUEL HIGHER THAN 1 G/TH PCI

Power in thermal units per hour		Vertical ascending emission speed in meters per second					
Higher than—	Lower or equal to—	5	6	7	8	9	≥10
	1,000	4	3	2	2	2	2
1,000	2,000	5	4	3	2	2	2
2,000	3,000	6	5	4	3	2	2
3,000	5,000	7	6	5	4	3	2
5,000	8,000	8	7	6	5	4	3
8,000	----------	----------	8	7	6	5	4

The vertical ascending speed emission velocity shall be at least 5 meters per second for the generators operating at full capacity or idle whose capacity is lower than or equal to 8,000 thermal units per hour; 6 meters per second for generators operating at full capacity or idle whose capacity is higher than 8,000 thermal units per hour as well as for generators in continuous operation; 9 meters per second for generators operating in modulated operation.

(4) SULPHUR CONTENTS IN FUEL HIGHER THAN 2 G/TH PCI

Power in thermal units per hour		Vertical ascending emission speed in meters per second			
		8	9	10	≥11
Higher than—					
----------	2,000	4	3	2	2
2,000	3,000	5	4	3	2
3,000	3,000	6	5	4	3
5,000	8,000	7	6	5	4
8,000	----------	8	7	6	5

In the case of generators in modulated operation, the vertical ascending emission velocity shall be higher than or equal to 9 meters per second if the boiler-house capacity is less than or equal to 8,000 thermal units per hour and at 12 meters per second if the boiler-house capacity is higher than 8,000 thermal units per hour.

Art. 16.—The hp value shall be computed in accordance with the following formula

$$h_p=\sqrt{\frac{340q}{C_M}\sqrt[3]{\frac{1}{R\Delta T}}}$$

Where hp is expressed in meters:

T is the difference expressed in Kelvin degrees, between the temperature of combusting gas at the outlet of the chimney, operating at a nominal pace in all generators and at room temperature;

R is the combusting gas outflow calculated for the operation at a nominal pace for the totality of generators, expressed in cubic meters per hour and counted at the effective ejection temperature of the combusting gas.

C_M is the highest concentration in pollutants that is admissible at the soil level, originating from the boiler-house in question, expressed in milligrams of sulphur dioxide per cubic meter; C_M is the difference between 0.25 milligram per cubic meter, the reference value and the annual average of concentration measured at a given site; C_M can be taken as a lump sum equal to 0.24 milligram per cubic meter in a little polluted area; 0.15 milligram per cubic meter in an averagely industrialized area; 0.10 milligram per cubic meter in a very urbanised or industrialised area.

q is the theoretical outflow of pollutants for the operation at nominal pace for the totality of generators of the boiler-house, expressed in kilograms per hour of sulphur dioxide; this outflow, for fuels whose sulphur content is less than 0.7 gram per thermal unit, shall be computed by rounding off the content of the fuel sulphur to 0.7 gram per thermal unit.

For fuels whose sulphur content is higher than or equal to 0.7 gram per thermal unit, the outflow shall be computed by rounding off to the higher unity the fuel sulphur content expressed in grams per thermal unit PCI.

If the boiler-house is equipped with several smoke ducts, the hp value of each duct shall be determined as if the total R outflow of combustible gas of this boiler-house evacuated through this duct.

Art. 17.—Natural or artificial obstacles of such a nature as to disturb the dispersion of combustion gas are those which are at the same time situated at a horizontal distance less than 10 (hp plus hs) of each smoke duct which have a width greater than 2 meters and which are seen from the chimney regarded from an angle higher than 15°.

In the case of boiler-houses located under a building or at the side of a building, this building shall be regarded as an obstacle.

Let hi be the height (in meters) of the point of an obstacle located at the horizontal distance d from the smoke duct, and let hi be defined as follows:

If d is less than or equal to 2 (hs plus hp) Hi equal hi plus hs;

If d is between 2 (hs plus hp) and 10 (hs plus hp), then

$$Hi=\frac{5}{4}(hi+hs)\left[1-\frac{d}{10(hs+hp)}\right]$$

Ho is the highest Hi value computed for all the points of all the obstacles defined in the first paragraph of this article.

However, the following obstacles shall not be subject to the same rule:

(1) In the case of boiler-houses containing installations of a total capacity contained between 75 and 150 thermal units per hour, if the smoke duct opens over a declining roof, the obstacle constituted by the roof shall be taken into consideration in the following manner:

If the declivity of the roof is higher than or equal to 0.15, Hi is the height of the roof increased by 0.40 meter;

If the declivity of the roof is less than 0.15, Hi is the height of the roof increased by 1.20 meters.

(2) When the obstacle is a building of a considerable height in the sense of Decree No. 67-1063 of November 15, 1967, a particular study shall be undertaken to determine the Hi height resulting from the taking into consideration of this obstacle.

Art. 18.—In the case of generators operating on heavy fuel oil, the temperature of combustion gas shall be measured, at the nearest point to the outlet into the atmosphere of the chimney, by a separate device different from that alluded to in articles 6 and 7 above.

Each combustion gas evacuation duct shall be equipped with such a device, which shall be placed at a distance from the outlet into the atmosphere equal at least to three diameters of the duct and at the most half of the distance from the outlet of the combustion gases into the chimney and the outlet into the atmosphere.

The temperatures observed by these devices shall be recorded.

TITLE II.—SPECIAL EMISSIONS

Art. 19.—The Blackening index:

(1) Generators operating on liquid fuels or on solid pulverized fuels, put into service as of January 1, 1976 shall not emit smoke whose blackening index, as defined in the French norm X 43002, exceeds 4, whatever their pace of operation, except in a transitory way and namely at the time of ignition, and when the chimney-sweeping of them shall be carried out in a discontinuous way.

(2) The generators operating on liquid fuels or on solid pulverized fuels which were put into service before January 1, 1976 shall not emit smoke whose blackening index exceeds 5, whatever their pace of operation, except in a transitory way and namely at the time of ignition and during the chimney-sweepings if these are carried out in a discontinuous way.

(3) The generators operating on solid non-pulverized fuals shall not emit smoke whose blackening index exceeds 6, whatever the pace of their operation except in an intermittent way and namely at the time of ignition and during the chimney-sweepings if these are carried out discontinuously,

(4) Starting on January 1, 1980, in the areas of special protection, defined in article 3 of decree No. 74–415 of May 13, 1974, regarding the control of emission of pollutants into the atmosphere and some uses of thermal energy, no generator, whatever its pace of operation and whatever fuel used, shall emit smoke whose blackening index exceeds 4, except in an intermittent way and namely at the time of ignition, and during the chimney-sweepings if those are carried out in a discontinuous way.

Art. 20.—Ponderal index:

(1) Generators with discontinuous chimney-sweeping

(a) Generators put into service on January 1, 1976.—The combustion gas of generators of a capacity less than 3,000 thermal units per hour, consuming solid fuels, shall not contain, per thermal unit of fuel consumed in the furnace and whatever the pace of operating of the generator, more than: 1 gram of dust in normal operations; in no case shall this content exceed the duration of 200 hours per year: 2 grams of dust in any case.

The combustion gas of other types of generators, whatever their pace of operation and the fuel used, shall not contain in normal operation, per thermal unit of fuel used in the furnace, more than 0.200 gram of dust if their capacity is less than 8,000 thermal units per hour, and more than 0.150 gram of dust if their capacity is higher than or equal to 8,000 thermal units per hour.

In no case shall these levels exceed 0.500 gram per thermal unit during a period not exceeding 200 hours per year or 0.250 gram per thermal unit during a period not exceeding 400 hours per year.

(b) Generators which were put into service before January 1, 1976.—Starting with January 1, 1978, the combustion gases coming from generators operating on solid fuels shall not contain, per thermal unit of fuel used in the furnace, more than:

1 gram of dust in normal operating; in no case shall this content be exceeded for more than 200 hours per year.

2 grams of dust in any case.

Starting with January 1, 1978, the combustion gases originating in generators operating on liquid or gaseous fuels shall not contain more than 0.250 gram of dust in normal operation.

In no case shall this content exceed 1 gram per thermal unit for more than 200 hours per year or 0.500 gram per thermal unit for more than 400 hours per year.

(c) Stating with January 1, 1980, in the special protection areas defined by article 3 of decree No. 74–415 of May 13, 1974, concerning the control of polluting emissions into the atmosphere and to certain uses of the thermal energy, every installation shall observe the provisions of the paragraph above.

2. *Generators with continuous chimney-sweeping*

The maximum dust content of combustion gas shall be for each category of generator, that which is indicated in the paragraph 1 above for the normal function of the generator, increased by 20 per cent.

Art. 21.—Without prejudice to implementation, in case of need, of specific regulations, the heating surfaces of the generators, of vents and chimneys shall be kept in a perfect state of cleanliness, and cleaned as often as is necessary, in order to reduce to the minimum the escape of soot and smoky charcoal into the outside atmosphere.

To this end, the cleaning tools shall be adopted to the specifications of the devices.

TITLE III.—ADMINISTRATIVE PROVISIONS

Art. 22.—The results of the ponderal emission measures of dust alluded to in article 7 (last paragraph) shall be kept at the disposal of the administration for a minimum period of a year.

Art. 23.—A chart of the chimney-sweeping deadlines shall be posted in every boiler-house containing generators which consume per hour, in maximal continuous operation, a quantity of fuel representing, in lesser calorific capacity, more than 1,000 thermal units.

Art. 24.—The keeping of a boiler-house ledger is obligatory for any boiler-house installation containing steam generators, hot water or other heat conveying fluids, which consume, per hour, in a maximal continuous operation, in lesser calorific capacity, more than 1,000 thermal units.

Art. 25.—The boiler-house ledger shall contain at least the following information:

(a) the name and address of the boiler-house, of the owner of the installation and, eventually, of the company in charge of its upkeep;

(b) specifications of the premises of the boiler-house, of the fuel storage installations, of generators, of heating equipment; fuel specifications foreseen by the builder, the results of the heavy fuel oil viscosity measurements and its temperature, the evacuation of combustion gases, the water processing; description of the fire regulation and control devices provisions taken to limit atmospheric pollution;

(c) general conditions for heat use;

(d) for the installations subject to the obligation of periodical inspection: results of the combustion and operation controls of the fire regulation devices; signature of the individuals having carried out the controls; report on the remarks made and the follow-ups given;

(e) general description of operating and important operational incidents namely: annual consumption of fuels;

(f) indications concerning the installation, replacement and repairs of the devices of fire regulation and control. Indication of any other work or upkeep and cleaning and chimney-sweeping operations.

Art. 26.—In every installation subject to periodical inspection, the head of the district meteorological service may impose any measure in accordance with the article and namely:

A determined recurrence for the clearing of the thermal exchangeable surfaces;

Verification of the state of the chimney;

Water supply processing or improvement of its processing;

The stopping of transportation distribution pipe leaks and of their accessories;

Efficient heat insulation of the parts of generators of the devices used as well as the transportation and distribution pipes;

The installation or the checking of purifiers;

The recovering of condensed water or vapor in the devices used,

Art. 27.—The provisions of the present decree shall be applied without prejudice, if such be the case, to the implementation of the regulations of dangerous, unhealthful or inconvenient establishments.

Art. 28.—The Delegate General for Energy, the Director for the Prevention of Pollution and nuisances, the Director General for Health and the Director of Constructions shall be in charge, each in his own domain, of the implementation of the present decree, which shall be published in the Official Gazette of the French Republic.

Made in Paris, June 20, 1975.

PREPARED STATEMENT OF AKIRO KINOSHITA

SOME NOTES ON U.S. COAL SHIPPED FROM THE GULF COAST

Basic viewpoint

Coal could provide the trigger to restore the economic mechanism and supply stability to the field of energy because it gives free and competitive options which come from the availability of so many types of coal and sources of supply of this widely distributed and abundant resource. These options should be made viable through vigorous technological innovations at all stages of the coal chain system.

It is a global challenge to break through the world's economic stagnation and associated energy constraints. Coal will bring various economic benefits, including the improvement of international balance of payment situations through a coordinated build-up of world trade, reorganization of large-scale infrastructures, development of related technologies and the creation of direct and indirect effective demands through stimulation of the coal-related industries. A long-term and stable coal trade can become an effective means to cope with the international trade imbalance and its instability which is mainly attributable to the unstable oil situation.

At the same time, the creation of options for abundant and stable substitute energy resources based on international cooperation has a great significance for opportunity costs to prevent the collapse of the established world economic order and possible conflicts between industrialized countries in securing energy resources.

The increase of coal use requires comprehensive international coordination and management for the consistent and effective operation of an overall chain. Each component of this chain is linked with the respective regional system, consisting of a series of facilities such as those for mining, processing, transportation, shipping, maritime transportation, storage, distribution, environmental protection, combustion and waste disposal.

Potential demands in Japan

The major steam coal use in the future of Japan is projected to be in electricity generation, as in the other countries, which is forecast to consume more than 70% of total steam coal by 1990. Estimates of coal requirements in the electric market are strongly influenced by assumptions about the rate of growth of electricity demand and the expansion of nuclear power.

In this projection, electricity is assumed to increase more or less at a rate of economic growth, taking into account progress in energy conservation and the continued transformation of the industrial structure. Electricity/GNP elasticities in the major industrialized countries show 1.5–2.0. There are assumed to shift, in common, to electricity in the energy consumption pattern. A rate of economic growth, 4.5% annually, is taken between 1980 and 2000.

Japan is one of the most active countries in seeking to realize international agreement and principles for shifting from oil to coal, with special consideration for a balanced approach which includes nuclear power development to overcome its particular serious energy situation. At present, 8 coal-fired power plants, 8,325 MW, are under construction or preparation. In addition, 5 plants, 5,000 MW, are to be approved in the near future as well as the coal conversion of 4 oil-fired plants, 1,149 MW. According to the long-term development program of electric utilities, installed capacity of coal-fired plants is to reach 28 GW by 1990.

Nuclear power already plays a substantial role in electricity generation. It supplies 16% of the total electric energy in 1980 and it is expected to increase its share up to 31% in 1990 according to the target set by the Government. However, there are several predictions as to whether it is possible to install all this nuclear capacity for the future. Exxon forecasts 37 GW, the institute of Energy Economics 36 GW and US Interagency Coal Export Task Force 20 GW–27 GW compared with the Government target, 51 GW–53 GW, respectively for 1990. And also, Exxon forecasts 75 GW, ICE 54 GW–68 GW compared with WOCOL, 90 GW–100 GW, respectively for 2000.

On the assumption of 36 GW for 1990 and 70 GW for 2000 in respect to nuclear capacity, Japan's needs for steam coal would be arithmetically calculated to be 89 Mtce for 1990 and 192 Mtce for 2000 including requirements for other industries. Japan will then have to import 171 Mtce for 1990 and 276 Mtce for 2000 including metallurgical coal. Feedstock requirements for synthetic fuel are not considered in these figures.

Of course, import-export trade regional patterns will be decided by factors such as economics, security of supplies, condition of infrastructure, viability of competitiveness, government intervention and so forth. Roughly, one-third of the total import requirements would depend upon the United States. In this sense, it is no doubt very urgent to set up an overall scheme for coal transactions between the two countries.

Environmental issues

Japan has been regarded as the most advanced country in developing environmental control. The Electric Power Development Company (EPDC) has been operating limestone type flue gas desulfurization units since 1967 for its coal-fired powerplants with an average service factor of almost 100%. The company has also been developing dry type FGD, a pilot plant of which has been in service since 1978 for commercialization by 1982.

Most of the environmental risks from coal use are amenable to technological control. On the other hand, each increment of reduction increases the cost. SO_x control costs are estimated at $16 per ton coal for 100 ppm emission and $18 for 50 ppm. Especially in the case where coal with a high sulfur content of more than around 3% is used, the costs jump discretely because dual FGD units must be prepared to meet the existing environmental requirements. In addition, it would not be easy to negotiate with local governments for change to using coal with a higher sulfur because of adverse public acceptance, even though emission limits can be cleared. At present, in almost all cases, in Japan 1 percent of sulfur content in terms of weight would be a parameter as the upper limit generally adopted, even on the assumption of providing FGD.

Environmental problems are highly regional. The control measures differ by countries because of geographical, climatic, ecological, industrial circumstances and social perceptions of values.

Almost all local governments have independently enacted pollution control ordinances which are much more stringent compared with the national standards. The important thing is not to consider loosening the standards and regulations but to overcome the environmental problems through technological improvement in order to effectively realize the coal objectives based on public acceptance.

Viability

Because of the high portion of inland and ocean transportation costs to the total delivered cost for Japan, the coal market is, in general, considered to be geographically bounded. Of course, the size of this geographical market area is determined by the delivered cost of competing coals, which is determined by a combination of production costs including capital charges, royalties and taxes, transportation costs, utilization costs including pollution control, and the degree of market price competition. In particular, we believe it is important to bring up a variety of viable options and alternatives in order to fulfill the function of market competition.

In the case of coal from Illinois Basin to Japan, we can basically point out the advantages of relatively stable low costs for inland waterway transportation as well as high BTU content against the disadvantages of high ocean transportation costs and high sulfur content in comparison to Western coal.

The size of ship will be essentially required to increase the economies of scale in order to overcome the handicap of maritime transportation, for which lower Mississippi ports have already started to cope with the situation. It would be required to meet, at least, 150,000 DWT by 1990. Maritime freight cost may be saved approximately 40 percent in case of 150,000 DWT size compared with that of 60,000 DWT. In respect to maritime transportation cost for Japan, the important viewpoint is to compare alternatives between passage through Panama Canal and the use of 100,000 DWT from the West to Japan. The cost difference would appear to reach around $17 per ton. In the case of the route for Japan, it would be limited to compensate the handicap of distance even with ships larger than 150,000 DWT, though there is reason to expect some reduction of the present cost through Panama Canal by means of the use of super large carrier. Furthermore, if the New Panama Canal, which can accept more than 100,000 DWT, were opened, economic viability of coal to be shipped from the Gulf Coast to Japan would be greatly increased. Also, there could be the application of coal-fired ships on the assumption that the price of bunker oil for the future will increase, though the price of bunker oil is slack at present.

In respect of the handicap of a high sulfur coal with content higher than around 3 percent, there must be expected a drastic reduction of production costs through the introduction of innovative production systems to be able to compare with Western coal with low sulfur content based on large scale surface mine system.

It is expected that there is sufficient possibility for the innovation of coal chain technologies involving wide aspects in operation management, since historically priority has never been given to coal development and also the industry itself has been in decline in contrast to the flourishing oil industry. I am convinced that comprehensive innovative approaches to the overall Illinois coal chain is an essential key to establishing an effective and efficient option in the Pacifiic coal market.

In addition, more attention should be paid to the characteristics of this supply region in terms of stability of transportation systems based on an independent and competitive system which may contribute to an emergency case. And also, relatively competitive supply systems along the Missisipi which can involve various sources in this region a well as competitiveness of waterway transport enterprises would be noted.

Necessary actions

Finally, I would like to point out several measures related to viability of coal to be shipped from Gulf Coast.

1. To clarify the overall Mississippi coal chain system, including the subsystem from mine to waterway, opening for the international market which will involve large international regional coal centers in the future.
2. To extend public support for the Mississippi coal chain in order to stabilize overall transport charges taking into account repercussive external economic effects induced by coal development in this region.
3. To encourage technological innovation in the waterway transportation system linked with bulky ocean coal transportation including continuous rapid transshipment system.
4. To encourage innovation in the coal mines including modernization and integration of small mines through financing, taxation, plant lease system and so forth.
5. To avoid the increase of imposed taxes and public charges to intensify competitiveness and government interventions and inefficient procedures on international trade and investment for coal development.
6. To organize a coal information system related to reserves, quality, production, transportation systems in this region in order to introduce the effective supplier into the free and competitive market.
7. To study the feasibility for establishing a large-scale coal stockpile at Lower Mississippi on an international basis taking into account the regional characteristics in terms of stable operation and physical endowment.
8. To promote international cooperation for examining the feasibility and framework related to the New Panama Canal Project in consideration of broader global effects.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO MR. KINOSHITA BY SENATOR PERCY

Question 1. Reliability of U.S. Coal Supply.

Answer. Although there are some skeptic observations on reliability of U.S. coal supply in line with political ban of grain export in the past, change of policy on collaboration for synthetic fuel development or government intervention on trade of automobiles for background, I feel relatively higher reliability with abundant coal reserves, strong strategic intention for getting rid of oil dependency on the world basis, and industry based business atmosphere. However, I feel also some uneasiness on the future trend of industrial organization related to coal business. And also, it is a fact that many businessmen have a fear of some pressure different from normal business negotiation.

Question 2. Reliability of Midwestern Coal.

Answer. I would like to point out, in particular, stability of transportation systems of this region based on an independent and competitive system along the Mississippi which involves various coal sources as well as competitiveness of waterway transport business. No experience of the strike in this waterway seaboard terminals must be worthy of special mention.

Question 3. Possibility of Blending.

Answer. In general, upper limit of sulfur content of coal to be burnt is 1.2 percent at present. On assumption of 0.8 percent sulfur content for coal from major sources, high sulfur coal of 2.0 percent would be limited to less than 20 percent. It is thought that there is little serious difficulty in blending on assumption of the blending facilities of the coal-fired power plant which has been recently built. And also, most of coal centers which are in planning will fulfill the function of blending. Of course, costs to provide additional space required for blending will have to be considered. Basically speaking, use of high sulfur coal could be encouraged by economic incentive based on delivered coal price, although it is not so simple to take additional burdens of high sulfur content in various aspects. Even higher sulfur coal could be used in an economic sense in case that additional costs for desulfurization can be sufficiently compensated in terms of delivered price.

Question 4. Future Size of Port.

Answer. The major steam coal use in Japan is projected to be in electricity generation. In Japan, most of coal-fired power plants will be attached with the undedicated privately owned port as in iron and steel industry. Maximum size of vessel which can be received by these coal-fired power plants will be Panamax type in most case for 1980s, but it will be over 150,000 dwt in 1990s. With regard to coal centers, according to the present plan, which more closely relates to coal use in industries, 150,000 dwt will be the maximum size of vessel to be received. It is essentially important for Japanese coal-fired facilities to employ larger size of vessel, because maritime transportation cost makes about 20 percent–35 percent of delivered price. Maritime freight cost may be saved about 40 percent in case of 150,000 dwt size compared with that of 60,000 dwt.

Question 5. International Coal Stockpile and Expansion of the Panama Canal.

Answer. I understand Midwestern coal could increase its attractiveness with addition of security through large scale stockpile to utilize unused large space on the Lower Mississippi taking into account stability of labor relationships in this region. Economics depends on price of land. The land price of this area, no doubt, must be cheaper compared with that of other regions such as in Japan.

Regarding the Panama Canal, several preliminary studies have been made. Project costs would amount to about 10 billion U.S. dollars in case of establishment of new canal. Economics of this project seems to depend upon future cargo passage and rate of interest. It would be difficult to attain economic feasibility with high rate of interest. Reduction of freight will amount to 40 percent on assumption of use of 150,000 dwt. And also, there must be sought through the moderative alternative for expansion at minimum costs. Significance of this concept should not be considered only in narrow economic aspect but in more global sense.

Question 6. Opportunities for Contract.

Answer. We are fully opened to enlarge trade channels and also interested in coal shipped from the Gulf Coast. Economics is a basic principle in business activities. In spite of our expectations for potentially of Midwestern coal shipped from the Gulf Coast as well as our analysis of its competitiveness, it is unfortunately a fact that actual offers from U.S. side are beyond our justification. Basically, compensation of additional maritime transportation costs and environmental control costs are the most important key factors in justification of its competitiveness with U.S. Western coal.

Senator PERCY. Panel No. 3, please come forward at this time. Panel No. 3 is a panel of high sulfur coal experts. Carl Bagge, president of the National Coal Association; John Banovic, president-elect of the Illinois United Mine Workers of America; Ramesh Malhotra, assistant vice-president for Marketing for Freeman United Coal Mine Co.; Wayne Ewing, the president of Peabody Coal Co., for Illinois; Hugh Evans, president of Old Ben Coal Co.; and Duke Portman, director, AMAX Coal.

Also, we have Michael Reilly and Richard Miller, presidents, of Zeigler Coal Co., and Marine Coal Sales; Alan Cope, assistant vice-president of marketing for Consolidation Coal Co.; and Robert Holloway, assistant to the president for Arch Minerals.

Gentlemen, because Mr. Carl Bagge will be making a statement on behalf of all coal producers, he has been allowed a few extra minutes to do that. This is the first time I have ever placed a limitation of 1 minute on any president, much less presidents of major coal companies, but I think you can appreciate that if we are to complete our conference today, we will have to be very careful about time.

TESTIMONY OF CARL BAGGE, PRESIDENT, NATIONAL COAL ASSOCIATION; JOHN BANOVIC, PRESIDENT-ELECT, ILLINOIS UNITED MINE WORKERS OF AMERICA; RAMESH MALHOTRA, ASSISTANT VICE-PRESIDENT OF MARKETING, FREEMAN UNITED COAL CO.; WAYNE EWING, PRESIDENT, PEABODY COAL CO.; J. HARLEY WILLIAMS, VICE-PRESIDENT, OLD BEN COAL CO.; MICHAEL REILLY, PRESIDENT, ZEIGLER COAL CO.; RICHARD MILLER, PRESIDENT, MARINE COAL SALES; ALAN COPE, ASSISTANT VICE-PRESIDENT OF MARKETING, CONSOLIDATION COAL CO.; AND ROBERT HOLLOWAY, ASSISTANT TO THE PRESIDENT, ARCH MINERALS

Mr. BAGGE. Thank you very much, Senator. My name is Carl Bagge, and I am president of the National Coal Association, an association of coal producers, sales companies and transporters as well as other companies and organizations with an interest in the coal industry.

I hope that my statement in full will be put in the record, and I will keep it as brief as possible, Senator. The statement really makes two-basically two essential points, Senator. It deals with the outlook for U.S. coals in the world market and the existing constraints, including inadequate port capacity which might prevent our country from taking full advantage of a growing coal market world-wide.

Second, the paper attempts to deal and articulate the principle actions which we, the Coal Industry, consider essential and appropriate to improve our ports and to deepen our harbors. Let me first point out, Senator, that Page 3 of the formal statement, I make the following points: That the United States is in a unique position to take advantage of a market that I described in the first two pages, and I think "market" has been identified for you here this morning by our foreign customers.

First, a coal reserve base large enough to support substantial increases in domestic coal use as well as exports without substantially affecting the price of coal. Second, an established highly competitive coal industry large enough to assure the continued availability of coal for long-term, large quantity requirements. Third, a potential for relative price stability, depending upon government policies, is discussed later in the formal statement, and finally, the long-term national political stability. This is what we have going for us, and coal producers, especially here in the Illinois Basin, have a further advantage of one of the best natural transportation systems in the world, the Mississippi River. But this is meaningless unless we get to the issue of dredging the lower Mississippi Basin, and I'd like to, if I can, take what moments of time I have here to discuss with you the question of greater seaport and coastal harbor capacities which are required to meet overseas market demands for U.S. coal and I begin that discussion on page 4 in the formal statement.

To assure that the U.S. position of the world coal marketplace becomes fully established and well secured in the next few years and over the last two decades of the century, those involved in the U.S. coal export delivery system must act, and act quickly, to upgrade and expand coal ports by the use of ground storage, coupled with modern bulk commodity coal-handling equipment and adequate coal pier space for ocean colliers at existing and new coal ports on the East, Gulf, west coast, and also on the Great Lakes. And we can't ignore the Great Lakes. And we can't ignore the Great Lakes when we're talking about the Illinois Coal Basin either. Sometimes that fourth great coast we have is sometimes ignored. Already there are several projects underway to provide such improvements at sea ports in Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Alabama. Coal producers in the Midwest will benefit from the improvements now underway in the New Orleans area, and I'd like to spend a few moments, if I can, talking about the need for expediting that kind of work to make this vast port available for midwestern coal.

Private enterprise has demonstrated that it can and will furnish landside improvements needed to provide additional, modern coal port capabilities for the U.S. coal exports. In fact, the Interagency Task Force on Coal Exports found one of the principal findings was, that the private sector did, in fact, respond to this explosion in the coal export market, which didn't really occur until the last two quarters of 1979. And we can state here publically that we will have, by the end of 1983, the capacity, we believe, the private sector has already committed the funds to make available pier facilities that, by the end of 1983, can handle up to another 150 million tons of coal that we can dump in the piers. The private sector has done this. What we are looking to now is for the Government to get on with the job of dredging these ports so we can accommodate and have the economies of scale, because, as many of our friends this morning pointed out, we are not competitive in some markets, there's a difference between the large supercolliers, the 150,000 ton deadweight ton ships that we must accommodate through dredging, and expediting the dredging will make us competitive in those markets as well.

The case for dredging was made very well by the Interagency Coal Export task force report. It made the point that the United States is in a position to capture a major share of a growing world coal market. In fact, some 200 million tons, we think, by the year 2000 can be our share of the world coal market. But cost is a key factor. The delivered price of U.S. coal in Europe can be reduced by $6 a ton, 10 percent of the current price, by capturing the economies of scale in transportation. Dredging sea port and coastal harbor channels to greater depths to allow 100,000 to 150,000 and higher deadweight-ton supercolliers to call at U.S. coal ports would be a major step toward achieving such economies of scale for U.S. coal in export markets.

Obviously, the traditional methods of full financing of these improvements, and I have mentioned here in page 6, the costs we're talking about. The ICE report mentions that to dredge only three ports, Hampton Roads, Mobile, and New Orleans, to 55 feet will cost in excess of $1.5 billion. The same report mentions the cost of improvements in New York would be another $140 million, in Baltimore, $278 million. Other ports are equally deserving of moneys for needed port and harbor improvements. The traditional methods of full financing of these improvements through general treasury funds, in our view, are inadequate in view of the total amounts needed in a relatively short period of time.

In recognition of this, and in recognition of the importance of making timely improvements, the National Coal Asssociation Board of Directors has adopted a position that these improvements should be funded, at least in part, by port fees equitably applied on a tonnage basis of all commercial traffic in a port.

Briefly, we support proposals which first authorize the dredging of ports and harbors to depths determined by the corps to be economically practical. Second, to authorize individual ports to levy a port fee to fund, at least in part, the cost of dredging the port to those authorized depths. These port fees, we believe, should be levied on a port-by-port basis according to broad guidelines set by the Congress, designed to give an individual port some flexibility to meet the requirements of its own traffic patterns, but designed to insure that these fees are fair and equitable to all port users. And finally, that the port fee should be levied on a tonnage basis, on all commercial traffic in the port, whether for export or import or for intracoastal traffic. And we make this plea, Senator, that Congress get on with the action, because obviously, the system isn't working today.

We have had hearings here before Senator Mathias just 1 month ago in Baltimore, and it has taken 19 years to try to dredge the Port of Baltimore to 55 feet. As we in Washington go to the various beaches in Delaware, across the Bay Bridge, they're still—like last week, I I counted something like 23 ships waiting to get into the Port of Baltimore. It's taken 19 years of litigation to finally come to a culmination where the corps is finally able to do something about it. The system, Senator, I submit is not working. Congress has to look at this very quickly and provide some fast-working mechanism by which we can get on with the business, and we in the coal industry are willing to share in the cost for use of the charges to get the job done. Thank you very much.

Senator **Percy**. Thank you, Mr. Bagge. I've learned a lot about our coal export crisis from reading your statement from that Baltimore hearing. That hearing, for the benefit of all of our guests today, was, I believe, the first hearing ever authorized on coal exports under the Foreign Relations Committee. That hearing was chaired by Senator Mathias, my good friend and chairman of the Senate Foreign Relations International Economic Affairs Subcommittee. Senator Mathias has a representative here with us today. I expect he will direct much of his prestige and work in the coming years toward seeing that we break these coal export bottlenecks. The Foreign Relations Committee is going to be very deeply involved in seeing that we move this along. I guarantee that.

Our next witness is John Banovic, president-elect of the Illinois United Mine Workers of America. Mr. Banovic comes from a family with three generations of coal miners, he is representing 21,000 members here in Illinois, and certainly if we are going to increase our exports, it's going to be done with the help, cooperation and full support of the men and women of Illinois. John, glad to have you.

Mr. **Banovic**. Thank you, Senator. My remarks will be brief and, I trust, encouraging to all of you assembled here, particularly prospective customers of Illinois and Illinois Basin high sulfur coal.

In 1980, Illinois ranked fifth in the total coal production among the coal producing States in the United States. In that same year, over 62½ million tons of coal was produced in Illinois, 35 million tons was produced in underground mines, and some 22 and a half million tons being produced at various surface mines throughout the State. Incidentally, this Illinois coal production in 1980 was the highest level of production that had been achieved in Illinois since 1972, and represented a significant increase over the production in the 2 previous years. Prior to that, the expiration of the UMWA Bituminous Coal Operators' Association contract this March, coal production in Illinois averaged over 5½ million tons for the first 3 months of 1981. I am happy to be here at this time to discuss these matters with you for a number of reasons.

First, we are pleased, given the softening in demand for high sulfur coal by electric utiliies in Illinois and elsewhere, that buyers are looking to our coal to create a potential market for it abroad, thereby taking up some of the slack caused by the domestic downturn. Secondly, on Saturday, our membership throughout the United States approved overwhelmingly the new UMWA–BCOA contract which will govern the operations of our labor in Illinois and throughout the United States for the next 40 months. Our negotiators never left the "main table" in Washington in their efforts to achieve this contract. Our union leaders from around the country worked hard with those negotiators to carry to them the opinions of the rank and file regarding the contract's provisions; and, in the most democratic fashion of any labor organization in the United States, over 80,000 of our members voted in ratifying this negotiated contract. We are pleased to be back to work today and operating under a fair and equitable labor contract which will govern our work until October of 1984.

New accounts characterized our contract strike position of "no contract, no work" as a tradition among the UMW. It is more than a tradition for us. We feel very strongly that the men and women we represent have a right to a labor contract which sets forth the terms under which they will work in what is still America's most dangerous industrial occupation. Workers have that right, under the Constitution and laws of the United States, to organize and to bargain collectively. We cherish that right and will always operate to protect it.

You may ask, quite frankly, I think, whether or not you, as potential customers for Illinois and Illinois Basin Coal, can depend on the companies with which we organize to keep their supply contract commitments to you over a long-term. It is my view, and I state this quite emphatically, that our skilled UMW members will perform, consistent with our labor contracts, in a manner that will assure your coal demands in the future are met. I make this statement based on recent production performances in the coal industry that I referred to a minute ago. I make this statement based on the productivity upturn on a "per-worker" basis that we have seen in 1979 and 1980. And I make this statement based upon a significant downturn since 1978 in days lost due to work stoppages in the Illinois coal fields.

Moreover, and more importantly, the coal companies' largest consumers, the electric utilities, have always had, during these contract strikes, adequate supplies of coal to meet their consumers' demand. And this year was no exception, as utility stockpiles data compiled over the last few weeks by the U.S. Department of Energy indicates.

Finally, I would like to point to a recent coal sales agreement that demonstrates the faith which at least one foreign coal producer has in UMW Illinois coal. Recently, the Nippon Kokan Steel Co. of Japan signed a short-term contract for 165,000 tons of soft coking coal with the Old Ben Coal Co. The coal will be mined at two of Old Ben's Franklin County mines and will be shipped by rail and by barge to the Orient. The mines producing the coal are UMW mines, and, more significantly, the contract was signed during our recent contract negotiations when the mines involved were not producing coal. We are pleased to see that demonstration of faith in UMW produced coal, and look forward to continuing our record of performance as the coal export market expands in future years.

Senator PERCY. Thank you, John.

Speaking for Freeman United Coal Mining Co. is Mr. Ramesh Malhotra. Freeman had a total production of 7.4 million tons in 1979, and employs 2,993 workers.

Mr. MALHOTRA. I am pleaesd to be here, Mr. Chairman, and I'd like to comment on the high sulfur coal, because the high sulfur coal is found in Ohio and other places, and I will concentrate my comments to Illinois Basin, which includes Illinois, Indiana and western parts of Kentucky. Because these coals compete with each other, so I'll concentrate—within this coal field we have over 215 billion tons of coal reserve, and it is estimated for 90 billion tons of coal would be mined economically today.

Considering that they are mining only 140 million tons of coal, we could expand the production by 10 fold and still will have no pain as far as reserve availability constraints is concerned. That is one positive aspect of this coal field which is not recognized in the international world. Second is that the Illinois coal, because of seam thickness, can be mined at a lower cost than the Appalachian coals, and history will show that mid-western coal has been sold anywhere from 20 to 25 percent below the Appalachian coal prices. We expect that as the low sulfur coal demand goes up, and the easily minable coals are mined out, the cost of production for Appalachian coal will have to escalate at a much faster rate than the mid-western coal, and the gap will become even bigger as the time goes.

In addition to the reserves and low cost of mining, we also have very a good transportation system, but the main reason why we have the problem as to the international market is because the Illinois Basin coal is not recognized in the international world; second, is the quality constraints. Illinois Basin coal is competent to be used in the international market, but the sulfur problem will completely curtail the growth of this coal. Thank you.

Senator PERCY. Thank you so much for your important remarks. Our next guest, Mr. Wayne Ewing, began as a laborer, and is now president of the Illinois Division of the Peabody Coal Co. Peabody

Coal in 1979, produced 64.4 million tons of coal. Peabody employs 14,000 coal workers, 5,684 of them in Illinois. Mr. Ewing?

Mr. Ewing. Senator, thank you very much for the opportunity to be here today. As you stated, Peabody Coal Co. is the largest coal producer in the country, producing some 60 million tons last year from a 10-State area. Here in the State of Illinois, we produced approximately 11 million tons of coal last year. We have, in the State, approximately 3 billion tons of reserves under control. About half of these reserves are located in the Belleville area on the southwestern part of the State.

The big advantage of these reserves in the southwestern part of the State, is that we have the Kaskaskia River that runs through the middle of these reserves, which gives us adequate transportation facilities to move this production to the ports for shipment. Currently we have approximately 10 percent production that we could now devote to the export market. We have on the drawing boards, mines that could be brought on in a fairly quick basis, and we would project that within the next—by the end of this—decade, that we could double our production here in the State of Illinois. Thank you very much for the opportunity to be here this morning.

Senator Percy. Thank you very kindly, Mr. Ewing.

Old Ben Coal Co. will be represented by Mr. J. Harley Williams, Vice President for Marketing. Total coal tonnage mined in 1979 was 10 million, and the company has 3,000 employees.

Mr. Williams. Thank you, Senator. The Illinois Coal Industry is poised to provide reliable export supplies. Illinois reserves are held by strong diversified corporations with a capability of providing capital resources for the long-term, and the newest entrants in the industry will add even more strength to the development of these resources.

The transportation options available to Illinois coal producers are second to none in the country. An excellent railroad network is in place providing good rail access to the south, to the Port of New Orleans, and north, to the Great Lakes and St. Lawrence Seaway. Short rail hauls from the coal fields to river terminals on both the Ohio and Mississippi Rivers should provide healthy Illinois competition between transportation modes.

We sincerely believe that private industry is the proper way to handle the development of U.S. coal exports. The State's coal resources, productive capacity, capital requirements, and infrastructure are very sound. What is needed is our own initiative to cultivate an emerging market overseas. If problems are encountered, we would expect the communication between industry and government so that a concerted effort can be made to remove any procedural hurdles.

Senator Percy. Thank you very much indeed.

Our next witness is Mr. Richard Miller, president of Marine Coal Sales. Marine Coal's parent company, Zeigler Coal Co., mines 3.8 million tons, and employs 1,464 people. Mr. Miller?

Mr. Miller. Thank you, Senator——

Senator Percy. Mr. Miller is joined, I might add, by Michael Reilly, president of Zeigler Coal Co.

Mr. Miller. That is correct, and the tonnages that you talked about were those of Zeigler Coal rather than Marine Coal Sales. My colleagues have already indicated the many strengths and benefits of

Illinois coal, so I won't repeat them. I would say that the coal industry has always welcomed and recognized the challenge, and we recognize a need for innovation in marketing Illinois coal for export.

Last evening, you indicated that you wanted to know of the problems in marketing Illinois coal, and these are the problems that I see in the short term and the midterm for marketing these coals. First, as we heard, the sulfur content is high, without flue gas desulfurization systems on new generating units, 3 percent sulfur coal is not acceptable as a fuel in the power industry in Europe or in most of Asia. Second, and I think it's important to recognize that Illinois coal is basically a high volatile coal, and, although the cement industry in Europe can use higher sulfur coals, it almost universally specifies volatile matter content between 20 to 30 percent. The reason, I am told, is because the cement industry there uses indirect firing methodology, which means the coal is first pulverized before storage, and it is also preheated prior to firing. The higher volatile coals present preignition problems and explosion potential, and, therefore, in almost every cement plant in Europe, they require lower volatile coals than Illinois basin coals are.

I think the third factor affecting the export of Illinois coal is the relatively low Btu content of most of the coal in Illinois. Buyers of energy will purchase on a delivered unit energy cost basis. Many coals in other parts of the world contain 10 to 20 percent more Btu's per pound. They are, therefore, more economic on a higher delivered price per ton cost, because the higher heating value of the coal results in lower unit energy costs.

In summary, I think we remain optimistic and are dedicated to the expansion of Illinois coal exports, but the task will not be an easy one. Thank you very much.

Senator PERCY. Mr. Reilly?

Mr. REILLY. I have nothing.

Senator PERCY. Our next witness is Alan Cope, assistant vice president of marketing for Consolidation Coal Co., which is owned by Conoco. Consolidation mined 8.6 million tons of coal in 1980, and employs 16.900 people. Mr. Cope?

Mr. COPE. Thank you Senator. Consol is Illinois' second largest coal producer, we produced 8.6 million tons in the State in 1980, and we have 1.8 million tons of reserves in the Illinois basin, so we are very interested in the mining of Illinois basin coal.

I would just like to make about three points from my testimony. We are developing—that's to say, Conoco, in association with Stone & Webster—promising technology for fluidized bed combustion. We are very excited about this, and we hope to go straight from tests to a commercial sized unit by 1983, that removes about 90 percent of the sulfur from the coal. I think this and other processes of that type could make a great contribution to the development of the market for high sulfur coal.

In the short term, I think the challenges were demonstrated this morning, since most of the specifications which our foreign visitors presented were for coals that cannot be produced in the Illinois basin, except by blending with other coals and our market research confirms that. We think that only about 7 percent of the European market can accept coal more than 2 percent of sulfur, which amounts to about 12 million tons of imports by 1990.

I think the U.S. Government could help by encouraging the development of desulfurization technology, particularly second generation scrubbers, and I think the IEA could encourage the European utilities to take steps to install scrubbing equipment to widen the choice of coal, because I think as the volume increases, they may be confining themselves to a too narrow range of supply. Third, I certainly underline Carl Bagge's remarks about the need to dredge our ports.

Senator **Percy**. Thank you very much. And finally, Mr. Robert Holloway, assistance to the president for Arch Minerals Co.

Mr. **Holloway**. Thank you, Senator. Arch Minerals is a native producer of steam coal throughout the United States with operating mines in Wyoming, Alabama, and Illinois. Within the State of Illinois and through our wholly owned subsidiary of Southwestern Illinois Coal Corp., we are annually producing about 8 million tons of bituminous coal, all currently for domestic consumption.

We feel quite strongly, however, that coal reserves within the United States, and more specifically, within the Illinois basin, can play a vital role in your effort to supply a greater percentage of world energy requirements. Illinois' prolific coal reserves and its ready accessibility to existing rail and water transportation make it a natural for transshipment beyond our borders.

The real question is, can Illinois coal meet required quality specifications. We think it can, either by consuming it by itself, or a component part of a blend. With this in mind, Arch Minerals is aggressively pursuing the opportunity for exporting our Illinois coal. The United States has made great progress in the area of food for peace throughout the world. I suggest that food for peace be expanded to also include "coal" or "energy for peace." We can produce the coal if our foreign customers can help us produce the peace. Thank you for giving me this opportunity.

Senator **Percy**. Thank you very much indeed. Mr. Bagge, first, you have heard from our foreign guests talking about the need for a consistent, reliable supply of steam coal. That's what they seem to want—more than even getting coal at the lowest price. They want reliability. How can we assure these foreign officials that they can rely on U.S. producers to get coal to them?

Mr. **Bagge**. Senator, I think nothing less than a Presidential statement, which I understand is soon to become forthcoming, due in large part to your efforts and the efforts of the Coal Caucuses, to do precisely that. I think, second, Senator, that we ought to, as we organize within the new administration—this may sound presumptuous of me, and I apologize if you think it is presumptuous, but I think that this administration hasn't yet set its house in order with respect to who has the lead in coal exports, as yet.

Now the Carter administration, they pursued, at least in the export area, the one area that I could agree with their policy with respect to coal, they did treat it as a national security matter, and it was housed in the office of the President, and was perceived as a national security issue where it belongs, and I hope and pray that this administration, and I hope, Senator Percy, will use your influence to see that the Reagan administration treats coal exports at the same highest level, as a matter of—in the office of national security, and not housed in the Department of Commerce or the Department of State. Not demeaning to those two agencies, but I do think that that's the best signal we can send abroad, that this administration is committed, as the Carter administration was, to seeing the development of coal exports in—as one of the essential dimensions of national security.

Senator PERCY. I am sure you know that the Governmental Affairs Committee, in which I serve as ranking Republican member, has the responsibility for oversight on the organization of the executive branch of Government. It is our job to see that the executive branch performs effectively, to eliminate overlapping and to find the place where the buck stops. In this case, we have got to know who we can hold responsible, as you point out. We will certainly follow through on that, an excellent suggestion. I want to assure you that we will also do everything we can to streamline the regulatory morass. This has been where you and the NCA have been so outspoken. Needless regulation structures drag down the process of port expansion over 20 years or more. We have simply got to find a way to break through and streamline that activity. We will enjoy working very closely with you on that.

Mr. BAGGE. Thank you, Senator.

Senator PERCY. Mr. Banovic, this is a really momentous day for you to be testifying, with the United Mine Workers around the country returning to work following the ratification of the new contract. We have heard a lot about how that contract will benefit both coal miners and coal operators, and how it points out an unprecedented cooperative spirit between the two groups. Are the mine workers now—can you put it on the record for us—ready to produce coal as never before? Can the United States and potential foreign buyers be certain that union-mined coal will be available for sale now and in the near-term future?

Mr. BANOVIC. There's no question in my mind that the mine workers are ready to produce coal, every mine in the State of Illinois is working today producing coal, which I think is remarkable. Also, as I pointed out in my testimony, our production per man has increased over the last several years, and which makes our competitive costs a little lower, so I'm sure that all the Illinois United Mine Workers are ready to get to the business of producing coal that the foreign market is looking for.

Senator PERCY. Thank you very much.

Mr. Malhotra, you have offered a ringing endorsement as to the strength of Illinois coal, and its export potential. How can we best get the word spread about about the advantage of Illinois coal to overseas buyers? What do you and your company expect to do to get that word out?

Mr. MALHOTRA. Well, one of the things is the conference that you are are holding now. It is probably one of the best modes of communications between the buyer and the supplier. We are working at Freeman United, we have recently signed a contract with Spain, and the coal should be moving this week, where the Spanish cement industry was concerned with the time of the contract, we are convincing them that the change of matter of views can make possible the use of operation coal. And this will be demonstrated at the task block, that we have signed contracts. We are working very closely with all the countries, trying to show them how in the United States, coal from the Illinois Basin has been burned and been used without problems. It is just a different—it's a fear of unknown which exists, and that's what we're trying to communicate by listening to them and meeting them. Thank you.

Senator PERCY. Thank you.

Mr. Ewing, how quickly do you believe Illinois coal companies commence large scale coal shipments to Europe or the Pacific rim? Are there any additional problems which effect Illinois coal, in particular, which must be overcome before a large amount of Illinois coal can be shipped overseas?

Mr. EWING. I guess the single-most problem now exists in the port facilities on the lower Mississippi. As far as the State is concerned, I think we're in pretty good shape, as far as transportation facilities are concerned, we have the availability of our rivers, and the lakes on the northern part, our rail system is in place, I think each one of our producers have productive capacity available at this particular time, I think most producers are set to add productive capacity should we be able to secure contracts, and so I think we're ready to go.

Senator PERCY. We are ready to go, then.

Mr. Williams, how quickly can Illinois producers commence exports to the countries who have representatives here today? What sectors should be targeted?

Mr. WILLIAMS. Well, I am particularly encouraged about what I hear from the cement sector, I think that's the area that we should concentrate on. I hope that we see a development of technology which allows us to use higher sulfur coal. One of the interesting things that came up is that the United States is going to have to get its own house in order as far as the use of high sulfur coal. I think we've got to quit looking at it as a fuel of last resort, we've got to fit it into a balanced fuel use. I find it ironic that we're hear today to ship our coal overseas when the biggest utility in the State doesn't use Illinois coal.

Senator PERCY. Mr. Miller, I am rather curious about how and when some of the companies first became interested in the export market for Illinois coal. Would you care to comment on the history of your own company's involvement?

Mr. MILLER. Well, our company is a relatively new company that was formed specifically for the purpose of getting into the export market, and for utilizing the capabilities that our parent and sister companies had, which included terminals, coal production, and barge transportation on the inland waterways. We have found—generally, the interest in Midwestern coal and coal moving through New Orleans to be very high in Europe and Asia. So I don't feel that the—that there has been much of a problem getting the word out to the world that the Illinois coal basin is here and it is available for production.

Senator PERCY. Thank you.

Mr. Cope, I would appreciate it, if you too, would comment on the question raised by all of our foreign visitors: Do Illinois coal producers really have the coal to export? Can our foreign buyers be sure of getting the coal they contract for?

Mr. COPE. Yes, we have the coal to export, and yes, we are taking steps to make sure that we can deliver and provide reliability of service, I think that's the key. We are developing a port in Baltimore that's costing $100 million. That helps West Virginia coal, but it doesn't help Illinois basin. But we're also interested in developing some similar long-term arrangements down in New Orleans for shipment of river coal. So I think the main problem is to create the demand for the coal now, and that's a matter of working on these technological problems.

Senator PERCY. I agree with you. I turn to you now Mr. Holloway. If we have an increased demand. from domestic users of coal, in your judgment, would we still have plenty of coal available for overseas buyers?

Mr. HOLLOWAY. Yes, sir, we certainly do. In fact, I told Mr. Senator from our State capitol in south, from our available reserves just in Illinois, we have the equivalent of more Btu's than all of the oil in all of the cartel nations. We have the coal here in Illinois, yes, sir.

Senator PERCY. Congressman Paul Simon, any comment from you?

Representative SIMON. Yes, one very brief reaction to underscore with Mr. Williams has just said here. Carl Bagge expressed an extremely important point in speeding up the Corps of Engineers activties in the ports, but Mr. Cope underscored what Dr. Lantzke said earlier, and that is the importance of moving ahead aggressively on research. We simply have not been doing the job that needs to be done in this Nation, and that's really a very key item for using this high sulfur coal.

Senator PERCY. Thank you very much, and I do wish to express appreciation to all of you for being with us today.

One last thing I would like to mention. Would it not be possible to draft a resolution of some sort, possibly through the Illinois Coal Association, to guarantee the fulfillment of all long-term contracts for high sulfur coal exports? This guarantee by our companies would go far toward removing doubts among foreign coal buyers about the reliability of our coal. That sort of assurance, I think, would be a remarkable thing for our foreign guests to take back to their governments, and for us to broadcast around the world. It would also give me a powerful tool to work with, as I meet with foreign leaders. Thank you very much.

[The prepared statements of Messrs. Bagge, Banovic, Malhotra, Ewing, Williams, Cope, and responses of Messrs. Miller and Cope to written questions submitted by Senator Percy follow:]

PREPARED STATEMENT OF CARL E. BAGGE

My name is Carl E. Bagge. I am President of the National Coal Association, (NCA) an association of coal producers, sales companies and transporters as well as other companies and organizations with an interest in the coal industry. I am also appearing here today on behalf of the Coal Exporters Association, an affiliate of NCA, which represents companies responsible for the export of over 80 percent of all United States coals overseas.

We appreciate the opportunity to appear before this hearing today on the outlook for United States coal exports and on the factors affecting International Utilization of High Sulfur coal.

My statement will focus on two points:

The future of United States coals in the world market, the existing constraints and the inadequate port capacity which might prevent the growth of our exports.

Principal actions which we consider necessary and appropriate to improve our ports. Specific factors affecting international utilization of high sulfur coal will be addressed by the other members of this panel.

THE FUTURE OF UNITED STATES COALS IN THE MARKET

1980 was a record year for U.S. coal exports as 90 million tons of steam and metallurgical coal were shipped to Canada and destinations overseas. Our experience of 1980 was a turning point in the history of U.S. exports. In the past, the 8–10 percent of our coal production which we have exported was primarily metallurgical grade coal for use in the coke ovens of Japan and Europe. We exported little steam coal to destinations other than Canada. In 1979, however we began to experience an increase in demand for steam coal as other nations began a rapid substitution of coal for expensive and politically unreliable oil for use under utility boilers and for industrial uses.

In 1978 we exported no steam coal. In 1979 we exported 2½ million tons of steam coal; in 1980, 16 million tons and this year we will ship an approximate 25 million tons of steam coal abroad. Over the next decade United States coals can play an increasingly important role in meeting the steam coal needs in Europe, the Pacific Rim nations and in other countries. The Interagency Coal Export Task Force report forecasts a potential world steam coal import demand which could be as high as 280 million tons in 1990 and 565 million tons by 2000. This report forecasts that the United States most probable share of this market will be 64 million tons in 1990 and 197 million tons in 2000.

National Coal Association forecasts are slightly higher, projecting U.S. shipments of up to 79 million tons of steam coal to overseas destinations in 1990. Couple this with an estimated export of 55 million tons of metallurgical coal and we would ship 134 million tons of U.S. coal overseas in 1990.

Forecasts are however, not yet reality, and there are a number of constraints to be addressed before the United States has the capability of exporting the quantities which will be needed by our customers overseas in future years.

I mentioned that the 90 million tons shipped for export in 1980 was a record. However, we failed to sell an additional 10 million tons to customers overseas due to constraints imposed by the capacity of our seaport and coastal harbors which existed because demand for United States coals was so much greater than the capability of our transportation and port system.

Despite extraordinary effort put forth by coal shippers inland coal carriers, and seaport operators in seeking maximum utilization of coal ports, seaport and harbor congestion which was evidenced by as many as 150 colliers at anchor in harbors and outer harbor areas, resulted in not meeting 10 to 15 million tons of overseas demand for U.S. coal in 1980. This is an intolerable situation when coal producers can now supply more than 100 million tons above exiting production levels using in-place mining capacity and 20,000 coal miners are waiting for work. The coal that did leave our shores last year created employment for some 32,700 coal miners and an additional 30,000 jobs in support industry as well as adding over 4.5 billion dollars to the balance of payments, but the lost tonnage cost our country at least another half-billion dollars.

GREATER SEAPORT AND COASTAL HARBOR CAPACITIES ARE REQUIRED TO MEET OVERSEAS MARKET DEMAND FOR U.S. COAL

To assure that the U.S. position in the world coal marketplace becomes fully established and well secured in the next few years and over the last two decades of this century, those involved in the U.S. coal export delivery system must act quickly to upgrade and expand coal ports by the use of ground storage coupled with modern bulk commodity coal-handling equipment and adequate coal pier space for ocean colliers at existing and new coal ports on the East, Gulf, and West Coasts. Already there are several projects underway to provide such improvements at seaports in Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia and Alabama. Coal producers in the mid-west will benefit from the improvements now underway in the New Orleans area.

Private enterprise has demonstrated that it can, and will, furnish landside improvements needed to provide additional, modern coal port capacities for U.S. coal exports.

The benefits of such initiatives are apparent and their impact in terms of reduced congestion should begin to be seen by mid 1982 or early 1983. This can be expected to allow U.S. coal exporters to recapture opportunities lost due to port-congestion and inability to load waiting colliers in 1980. Such circumstances led a number of potential customers away from U.S. coal last year. They were discouraged by the long lines of waiting vessels and huge demurrage costs that resulted which raised the price of U.S. coal delivered to Europe by more than 12 dollars ($12) a ton—some 15 to 17 percent of the delivered price.

Although we can have a great deal of satisfaction from these ongoing and imminent accomplishments the challengers ahead require even greater effort and active government participation. These are: (1) dredging seaport channels and harbors to depths necessary to accommodate colliers that are 100 thousand to 150 thousand or more deadweight-tons in size in addition to the 60,000 dwt vessels now commonly used and (2) adopting a fast-track permitting process for groundside, harbor and channel improvements at the ports along with an expedited environmental review procedure in order to achieve modern coal port operations on the East, Gulf and West Coasts and on the Great Lakes.

The case for dredging was made very well by the Interagency Coal Export Task Force Report. It made the point that the U.S. is in a position to capture a major share of the growing world coal market. But cost is a key factor. The delivered price of U.S. coal in Europe can be reduced by 6 dollars ($6) a ton—10 percent of the current price—by capturing economies of scale in transportation. Dredging seaport and coastal harbor channels to greater depths to allow 100 thousand to 150 thousand and higher deadweight-ton supercolliers to call at U.S. coal ports would be a major step toward achieving such economies of scale for U.S. coal in export markets.

Port and harbor improvements are in themselves very expensive. The aforementioned ICE report mentions that to dredge to 3 ports—Hampton Roads, Mobile and New Orleans—to 55 feet would cost in excess of 1.5 billion dollars. The same report mentions that costs of improvements in New York would be approximately $140 million and in Baltimore $278 million. Other ports are equally as deserving of monies for needed port and harbor improvements. Obviously, the traditional methods of full financing of these improvements through general treasury funds, are inadequate in view of the total amounts needed in a relatively short amount of time.

In recognition of this, and in recognition of the importance of making timely improvements, the National Coal Association has adopted the position that these improvements should be funded, at least in part by port fees equitably applied, on a tonnage basis, on all commercial traffic in a port. Briefly we support proposals which:

Authorize dredging of ports and harbors to depths determined by the Corps of Engineers to be economic and practical.

Authorize individual ports to levy a port fee to fund, at least in part, the costs of dredging the port to those authorized depths.

These port fees:

Should be levied, on a port-by-port basis, according to broad guidelines set by the Congress designed to give an individual port some flexibility to meet the requirements of its own traffic patterns but designed to ensure that those fees are fair and equitable to all port users.

Should be levied on a tonnage basis, on all commercial traffic in the port whether for export, import or for intra-coastal traffic.

But, if non federal interests are to pay, at least in part, for these improvements, the non federal interest should be assured that those improvements will be accomplished within a reasonable timeframe. Accordingly, any proposal calling for non federal financing of port and harbor improvements should include a mechanism for expediting permitting procedures and the environmental review process for both groundside facilities and for the actual dredging work.

Fast track permitting and expedited environmental review are activities which properly may be made the lead responsibility of the Corps of Engineers in its traditional role with respect to port development projects. In regard to expedited environmental reviews it is considered essential that a lead organization be designated to coordinate local, state, multi-state, and federal agency participation in the process. Both permitting and environmental review should be mandated for completion within a strict, relatively short time frame, on the order of 180 to 270 days. We would be happy to share with you, our detailed suggestion for expedited environmental review and will submit them for the record.

This concludes my remarks Mr. Chairman. As I mentioned at the outset of my statement my colleagues will discuss the outlook for Illinois coal in the export market. At the conclusion of their statements I would be happy to answer any questions you might have.

PREPARED STATEMENT OF JOHN BANOVIC

My name is John Banovic and I am the president-elect of District 12 (Illinois) of the United Mine Workers of America. I assume my duties as president in July of this year and will then be representing, on behalf of the District, more than 20,000 working and retired coal miners in this State. I am pleased to be here today to discuss briefly, from the UMWA perspective, the prospects for making available, on a reliable basis, high sulfur coal for the expanded international export market. My remarks will be brief and I trust encouraging to all of you assembled here, particularly prospective customers for Illinois and Illinois basin high sulfur coal.

In 1980, Illinois ranked fifth in total coal production among the coal producing States in the U.S. In that same year, over 62½ million tons of coal were produced at 66 mines in 22 Illinois counties. Of this total production, almost 35 million tons were produced in underground mines with some 27½ million tons being produced at the various surface mines throughout the State. Incidentally, this Illinois coal production in 1980 was the highest level of production that had been achieved in Illinois since 1972, and represented significant increases over production in the three previous years. Prior to the expiration of the UMWA-Bituminous Coal Operators Association contract this March, coal production in Illinois averaged over 5½ million tons for the first three months of 1981.

United Mine Workers of America members produced better than 97 percent of this tonnage in 1979. Of the almost 18,300 persons who were employed at Illinois coal mines in 1980, according to Illinois Department of Mines and Minerals computations, 96.2 percent of those employed worked at mines which were organized by the UMW. In short, as you can see, Illinois coal is UMWA coal . . . My union is proud of its success in organizing almost all of the coal produced in this State. Additionally, Illinois has the largest reserves of bituminous coal of any State in the U.S. Most of that coal is high sulfur, having between 2 percent and 4 percent sulfur content. It is also coal with a high energy content, averaging up to 12,500 Btu's.

I am happy to be here at this time to discuss these matters with you for a number of reasons. First, we are pleased . . . given the softening in demand for high sulfur coal by electric utilities in Illinois and elsewhere . . . that buyers are looking to our coal to create a potential market for it abroad, thereby taking up some of the slack caused by the domestic downturn. Secondly, on Saturday, our membership throughout the United States approved overwhelmingly the new UMWA-BCOA contract which will govern the operations of our labor in Illinois and throughout the United States for the next 40 months. Our negotiators never left the "main table" in Washington in their efforts to achieve this contract: Our union leaders from around the country worked hard with those negotiators to carry to them the opinions of the rank and file regarding the contract's provisions; and, in the most democratic fashion of any labor organization in the United States, over 80,000 of our members voted in ratifying this negotiated contract.

We are pleased to be back at work today and operating under a fair and equitable labor contract which will govern our work until 1984.

Achieving this labor contract came only after all the coal production in Illinois and much of the coal production throughout the United States was halted for some 70 days. News accounts characterized our contract strike position of "no contract, no work" as a tradition among the UMW. It is more than a tradition for us. We feel very strongly that the men and women we represent have a right to a labor contract which sets forth the terms under which we will work in what is still America's most dangerous industrial occupation. Workers have the right, under the constitution and laws of the United States, to organize and to bargin collectively. We cherish that right and will always operate to protect it.

You may ask, quite frankly, I think, whether or not you, as potential customers for Illinois and Illinois basin coal, can depend on the companies with which we organize to keep their supply contract commitments to you over the long-term. It is my view, and I state this quite emphatically, that our skilled UMWA members will perform, consistent with our labor contracts, in a manner that will assure your coal demands in the future are met. I make this statement based on the recent production performances in the coal industry that I referred to a minute ago. I make this statement based on the productivity upturn on a "per-worker" basis that we have seen in 1979 and 1980. And I make this statement based on a significant downturn—since 1978—in days lost due to work stoppages in the coal fields. Moreover, and more importantly, the coal companies' largest customers, the electric utilities, have always had during these contract strikes adequate supplies of coal to meet their consumers demands. And this year was no exception, as utility stockpile data complied over the past few weeks by the U.S. Department of Energy indicates.

Finally, I would like to point to a recent coal sales agreement that demonstrates the faith which at least one foreign coal purchases has in UMW-mined Illinois coal. Recently, the Nippon Kokan Steel Company of Japan signed a short-term contract for 165,000 tons of soft coking coal, with the Old Ben Coal Company. The coal will be mined at two of Old Ben's Franklin County mines and will be shipped by rail and by barge to the Orient. The mines producing the coal are UMW mines, and more significantly, the contract was signed during our recent contract negotiations when the mines involved were not producing coal.

We are pleased to see that demonstration of faith in UMW produced coal and look forward to continuing our record of performance as the coal export markets expand in future years.

Thank you.

PREPARED STATEMENT OF RAMESH MALHOTRA

My name is Ramesh Malhotra, and I am assistant vice president of marketing with Freeman United Coal Mining Co. in Chicago. As part of my testimony I would like to briefly describe the status of Illinois Basin coals in the international coal market.

Within the Illinois Basin, which includes coal deposits of Illinois, Indiana and the western part of Kentucky, over 215 billion tons of coal resources have been identified. Of this amount, most recent estimates show that at least 90 billion tons could be economically mined. Considering that currently only 140 million tons of coal per year is being produced from this coal field, it is apparent that current production could easily be expanded by ten fold without experiencing any reserve availability constraints.

In addition to the availability of large reserves, better mining conditions enable coal in the Illinois Basin to be produced at a relatively lower cost than Appalachian coals. Historically, on the average, Illinois Basin coals, on a f.o.b. mine price basis, have been sold at anywhere from 20 to 25 percent below Appalachian coals. We expect, as the more easily minable coal reserves in the Appalachian field are depleted, the differential in the costs of production will become even greater.

Because of its location the Illinois Basin coal field is accessible via four navigable rivers and is also served by a network of ten different railroads. The accessibility of this coal field by such a diversified transportation network makes these coals a dependable source of supply for both domestic and international trades.

Another attractive feature of Illinois Basin coals is the uniformity of the product that is shipped to the customer. In the Illinois Basin over 85 percent of the coal found is known to contain sulfur exceeding three percent. To reduce the sulfur content, most of the coal produced in the Illinois Basin is mechanically cleaned before it is shipped to customers. Because of the mechanical cleaning, Illinois Basin coal producers are able to provide their customers with a more uniform product.

In spite of all these positive aspects, Illinois Basin coals have not always been favorably accepted within the U.S.A. or in the international markets. Domestically, federal, state and local regulations are constraining the expanded use of Illinois Basin coals. In the international markets, there are basically two reasons why the Illinois Basin coals have not yet been accepted. The first is a lack of knowledge about Illinois Basin coals among the international community, and the second factor is the stringent coal quality requirements that are being imposed by international coal buyers who are seeking U.S. coals for security and dependability.

Within the past year, due to the problems of ocean vessel demurrage and reliability of coal supply from Appalachia, Illinois Basin coals have come to the attention of several international coal buyers. Some coal from the Illinois Basin has already been purchased and shipped to Europe and Japan. It is expected as long as the problem of demurrage in the east prevails, Illinois Basin low sulfur coals will continue to find some markets in foreign countries.

Unfortunately, the quantity of low sulfur coal that could be supplied from the Illinois Basin is limited. We envision due to this resource constraint the expanded use of Illinois Basin coal in the international market will not take place until the foreign buyers modify their coal quality specifications to accommodate Illinois Basin high sulfur coals. This concludes my comments and thank you for giving me this opportunity to express my views. If you have any questions, I will be pleased to answer them.

Prepared Statement of Wayne T. Ewing

Mr. Chairman and Members of the Subcommittee, my name is Wayne T. Ewing, and I am President of Peabody Coal Company's Illinois Division, which is headquartered at Fairview Heights, Illinois.

I appreciate the opportunity you have provided me to appear at this timely forum and to comment on the subject of coal exports.

As you probably know, Peabody Coal Company is the nation's largest coal producer. Last year, 1980, Peabody produced over 59 million tons of coal from a ten state area.

As President of the Illinois Division, I have the operational responsibility for the eight Illinois based mining facilities, which last year produced over eleven million tons of Illinois coal. Some sixty percent of that coal was produced by underground operations, and the remaining forty percent represents the Division's three surface mines' production.

Currently, Peabody controls approximately three billion tons of coal reserves in the state of Illinois. Over one half of these reserves are located in the southwestern portion of the state in and around the so-called Belleville mining area, covering portions of St. Clair, Randolph, Washington and Madison counties. Intersecting the Peabody reserves in this area is the Kaskaskia River. The Kaskaskia River is a channelized waterway which empties into the Mississippi River below Evansville, Illinois in Randolph County. Also, crisscrossing this area is the Illinois Central-Gulf, Missouri Pacific, Family Lines and Southern Railroads.

The Belleville area presently serves as the center of Peabody's mining activities in the state and accounts for five of the Division's eight Illinois based mines. It is also primarily in this area that the company is planning its future coal development efforts, which are partially under consideration in response to an expected expanding coal export market.

In attempting to assess the Division's productive capabilities in response to the increasing export market, I can offer the following scenario:

The Division has at present an excess productive capacity of some ten percent at its operations in the Belleville area. This means that, should conditions warrant, the five area mines could produce approximately 600,000 additional tons of coal during the second half of 1981. We also have the flexibility of adding additional production capacity at one of our mines in a relatively short time frame.

The Division has, in an advanced stage of planning and partial development, two additional underground mines for the Belleville area. These mines, known as St. Libory and Tilden, could be operational in a two to four year time frame, and could provide, at full production, approximately 2.8 million tons annually. While these two mines were scheduled to be brought on line gradually to replace declining production at the area surface mines, they could, in fact, be brought on line much quicker in response to a strong foreign market and utilized until needed for tonnage for current contracts serviced by our depleting surface mines.

The Division has in the planning stage a large mining complex to be located along the northern channelized portion of the Kaskaskia waterway between New Athens and Fayetteville, Illinois. This complex will consist of our new underground mines, a new coal preparation plant and a new dock facility on the Kaskaskia. Should market conditions warrant, initial coal deliveries from this potential six million tons per year complex could commence by the mid 1980's with full production coming in the latter part of the decade.

In summary, assuming favorable market conditions, the Division's productive capabilities in the Belleville area, by the late 1980's, could be nearly double its present annual capacity.

I would also like to point out that the Division has other coal reserves in the state that could be allocated to the foreign market. Our Rileyville Reserves, in the far eastern portion of the state, contain strong coals, low in sulfur and high in heat value, which are presently under evaluation for potential export.

Not only does the Illinois Division have excellent productive capabilities which could provide significant coal tonnages for the foreign market, it also has a superior transportation capability in the Kaskaskia River. The location of the Division's reserves and mining facilities in relation to this waterway provides the company with a direct link to the Mississippi River, thereby gving us an excellent foreign commerce potential.

In concluding my remarks, I would like to relay to the subcommittee Peabody's assessment of the export coal market, and the company's recent efforts to participate in this market.

Sometime ago, Peabody Coal Company recognized the importance of the world wide coal market and foresaw the United States as a leading supplier in that market. In view of Peabody's leadership in the United States coal industry, Robert H. Quenon, the company's President and Chief Executive Officer, initiated an intensive program, which was designed to market Peabody coal abroad. Since that time a number of activities have taken place:

Coal reserves have been identified in a number of Peabody's operating divisions, and those reserves have been and are currently being evaluated for potential export.

Peabody sales and marketing personnel have been dispatched abroad to meet with potential customers. Selected foreign customers have, in turn, been invited to meet with Peabody personnel and to tour Peabody facilities. As an example, I might mention, that the Illinois Division recently hosted an important trade delegation from Taiwan and representatives from France.

We have been working with other companies concerning the construction of a large coal loading terminal in the New Orleans-Baton Rouge, Louisiana area which could play an integral role in Peabody Coal Company's efforts to market its coal abroad. A decision to proceed with construction of such a facility is expected before the end of this summer.

Peabody has also publically supported the Corps of Engineers proposed project that would provide a deep draft (55 foot channel) to the ports of New Orleans and Baton Rouge, Louisiana, and to other port facilities on the east and west coast.

Peabody Coal Company is currently engaged in numerous other activities designed to promote coal exports. The areas of involvement. I have mentioned here today, should give you an indication of our overall commitment to this vital and growing market.

RESPONSES OF MR. EWING TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY

Question 1. It is clear that what foreign buyers are looking for most of all from their coal suppliers is a reliability of supply. The brief period of time allotted you in the hearing precluded my asking you a very basic and fundamental question: Does your company have coal to export? Please indicate the amount and approximate location of your available reserves, if possible. If your company was to have a sudden surge of domestic demand for your coal, would there still be available reserve to meet the demands of foreign buyers?

Answer. Yes. Peabody Coal Company does have Illinois coal available for export. Peabody controls in excess of two billion recoverable tons of coal in southern Illinois, primarily of the Illinois No. 6 seam. The bulk of these reserves are located within a fifty mile radius of St. Louis, Missouri.

According to current production projections, Peabody could provide from one to two million tons annually to export markets from Illinois operations over the next five years. Six new underground mines with a total production capacity of approximately 8.4 million tons are currently being planned for southwestern Illinois, and could be brought into production by 1990 if long term demand for their product were to materialize.

We have sufficient reserves and planned operations to meet the demand of foreign buyers, even if domestic demands were to surge dramatically over the coming years. Due to the size and scope of our existing and planned operations, we have the flexibility to increase our output as markets develop.

Question 2. Your testimony touched in part on some of the many inherent advantages which Illinois coal enjoys—the productivity of Illinois mines, Illinois' access to ideal transportation, etc. How can the word best be spread to foreign buyers about the advantages of Illinois coal? What do you and your company expect to do to "get the word out"? What should be the role of state and federal governments?

Answer. We believe that information regarding the advantages of Illinois coal can best be made available to potential foreign buyers through direct personal contact and complete explanation of our capabilities. We do have literature available which summarizes our plans for increased production to meet market demands.

This sort of information is suitable for initial contact. However, if genuine interest is expressed by a potential customer, we would prefer to personally describe the advantages of our operations in complete detail. A physical tour of our facilities is actually the best means of exhibiting our way of conducting business.

State and federal government agencies can aid us by informing us of viable business opportunities which they become aware of through normal contacts. We would be most willing to make available literature concerning our company for distribution by government agencies during their dealings with foreign parties.

Question 3. How and when did your company first become interested in the export market for Illinois coal?

Answer. Peabody began to actively pursue the export market for Illinois coal approximately eighteen months ago. The obvious growth in international steam coal consumption over the coming years lead to expanded efforts on our part geared toward export markets.

PREPARED STATEMENT OF J. HARLEY WILLIAMS

My name is J. Harley Williams. As Vice President of Marketing for Old Ben Coal Company, one of Illinois' and the nation's largest coal operators, I have seen many projections over the years concerning expected increases in U.S. coal production and use. The most recent round of forecasts give much attention to the use of U.S. coals overesas.

As is the nature of all economic projection, the forecasts set a range for U.S. coal exports; an attempt to describe the potential of an uncertain event. Witness the projections developed by the World Coal Study team and the Interagency Coal Export Task Force. While the absolute numbers themselves are of value, the range of the projections and the description of both potential and uncertainty are more important. As I will elaborate later, the issue of range is key to a discussion of the potential for Illinois high sulfur coal exports.

The events of the past several years have finally given us an understanding of the fact that we are dealing with world resources in a world economy, and that no mineral energy resource is infinite regardless of how abundant it appears at any given point in time. Had we in the United States had the foresight to come to grips with this fact years ago, we never would have advanced the view that coal was the "fuel of last resort" in meeting many of our electrical and industrial energy requirements. In a finite system, no resource should be viewed as a last resort if a balance energy program is ever to be achieved. Because coal was viewed as such during the era of perceived oil and gas abundance, we found ourselves in the 1970's burning several million barrels per day of oil equivalent as boiler fuels; a role that should have been performed through extensive coal utilization. But, the objectors were strong and the objections to increased coal use were many and varied. As a result, while biased incentives to use oil and gas (low controlled prices) were kept in place, oppressive regulations disrupting coal use were imposed, and the high sulfur coal segment of the industry was particularly hard hit. So, it is ironic, yet interesting to note that we are addressing the means to use Illinois high sulfur coals overseas, while the state's largest electric utility burns only token amounts of Illinois coal.

There is, however, a message in our history of taking the short term view of resource management, and a lesson to be applied to the development of Illinois coal exports in the future. While we recognize the need for staged advancement of resource management, it should not be necessary to develop a stage that retards the long term goal of a balanced energy program; a program that advances the utilization of all coal resources, regardless of sulfur content is in order. It is our job to ensure that foreign countries do not develop the short term view that while coal burning has become necessary, high sulfur coal burning is now the "choice of last resort." This viewpoint is regressive and will not provide sustained growth across all coal markets and all coal fields. Illinois coal operators cannot accept a boom and bust environment. To commit the necessary capital and manpower to an integrated export development program, sustained and assured growth is vital. Sustained growth minimizes the uncertainty and will bring us closer to achieving the upper range of recent coal export projections. The fate of Illinois high sulfur coal exports lies here.

European and Pacific Rim countries have become as environmentally sensitive as the United States. The advancing view is that the current availability of world low sulfur coals will be adequate to sustain primary energy needs under most low growth scenarios. The fact that non-U.S. low sulfur coals are more than competitively priced even as compared to our high sulfur coals, create a strong impression of ample resource availability. High sulfur coals are seen only as a necessary evil when higher demands ultimately bring us closer to the upper range of coal export projections. The underlying assumption is that if the low sulfur coals are abnormally depleted, the higher sulfur coals will be there as a fallback measure. The prudent resource management decision would be to stretch out those low sulfur resources for selected industrial processes in environmentally sensitive areas.

To achieve a sustained growth for Illinois coal exports, we should help overseas users understand that the utilization of a wide range of coals in environmentally acceptable ways will serve both their short and long term interests best. We must find niches in the export market where our coals fit best. Then, we must be cost effective in our mines and transportation systems. We must work on engineering sales, sell our ideas overseas, and, we must think big. A balanced commitment to coal use is needed, including power generation, industrial processes, and, in the near future, supplementing of liquids and gases through synthetic conversions. Ultimately, coal should be most valuable for its carbon.

Each energy resource; oil, gas, uranium, oil shale, tar sands, solar power in all its forms, low sulfur coal and high sulfur coal, has its own optimal, end use application: coal, uranium and geothermal for boiler fuel; coal for carbon; oil (natural and synthetic) for transportation; gas (natural and synthetic) for chemical feedstocks and residential use; solar, wind, hydro, biomass, for supplemental heat and energy. The objective is to ensure, both here and abroad, that the proper long term application is realized, and wasteful, short term solutions are discouraged. This task should begin now, at home.

The Illinois coal industry is poised to provide reliable export supplies. The state ranks first in recoverable underground reserves and third in total strippable reserves, behind only Montana and Wyoming. There is a good mix of underground and strip productive capacity currently in place. Because many operations have been running with reduced shifts or shortened workweeks, there is substantial surge capacity readily available on short lead times. Illinois reserves are held by strong, diversified corporations with the capability of providing capital resources for the long term, and the newest entrants in the industry will add even more strength to the development of the state's resources.

Illinois mines, both deep and strip, are highly mechanized and safe, with modern preparation plants and coal loading facilities.

Illinois mines appear to have weathered the damaging impacts of the Federal Coal Mine Health and Safety Act of 1969, as amended in 1977, and many other regulations, and a turnaround in productivity has begun to take place. Between 1969-1979, Illinois underground mine productivity was more than cut in half; from 22.9 tons per man day in 1969 to 11.2 in 1979. For the year 1980, productivity increased to 13.5 tons per man day; a 20 percent recovery over the year earlier level. We expect the trend, not necessarily at the same rate, to continue into the 1980's.

Illinois surface mines have employed sound reclamation programs over the years, and should not have to play substantial catch up to comply with new reclamation programs.

The highly concentrated United Mine Workers of America labor force in the state has caused considerable work stoppages, but we have hope that this will change. Under the 1978 UMWA contract agreement there has been 85 to 90 percent fewer work stoppages in the state compared with the previous agreement. The ratification of the initial 1981 contract proposal by Illinois' union membership, points toward a revitalized work ethic and an understanding of the need for reliable labor in the coal mines. It is most unfortunate though, that the present contract strike is with us today. We believe this union is doing unbelievable damage to its members and itself and to those operators employing UMW labor.

The transportation options available to Illinois coal producers are second to none in the country. An excellent railroad network is in place providing good all rail access south, to the Port of New Orleans and north, to the Great Lakes and St. Lawrence Seaway System. Short rail hauls from the coalfields to river terminals on both the Ohio and Mississippi Rivers for barge movement beyond, should provide healthy competition between transportation modes.

We sincerely believe that private industry is the proper way to handle the development of U.S. coal exports, and we would ask government only to support us in our objectives. The state's coal resources, productive capacity, capital requirements and infrastructure are sound. What is needed is our own initiative to cultivate an emerging market overseas, while reaffirming our committment to a balanced resource management at home. We do appreciate the show of interest by this committee, and are willing to keep the line of communication open between industry and government, so if problems are encountered, a concerted effort can be made to remove procedural hurdles.

PREPARED STATEMENT OF ALAN COPE

My name is Alan Cope. I am assistant vice president, Marketing, for Consolidation Coal Company. Thank you for this opportunity to comment on the prospects for Illinois Basin coal.

Consolidation Coal Company is the nation's and Illinois' second largest coal producer. In 1980 production from Consol's mines and those of others supervised by Consol totaled 49.6 million tons. Consol's production in Illinois was 8.6 million tons in 1980. Consol holds 1,774 million tons of reserves in the Illinois Basin of which 1,066 million tons are in the state of Illinois.

On a clean, dry basis, washing at a specific gravity of 1.6, the average sulfur value for Illinois Basin coal is 3.0 percent, or 4.5 pounds per million Btu's. On the same clean, dry basis, the average sulfur values for Illinois coal is 2.8 percent, yielding 4.3 pounds per million Btu's.

Consol thus has a strong interest in the mining and use of Illinois Basin high sulfur coal. The most logical place to market this coal would be in Illinois itself and adjoining states. However, the Clean Air Act has severely impaired the marketability of the coal in this region. We estimate that 10 to 12 million tons of Illinois Basin coal has been displaced by western coal because of the SO_2 standards imposed pursuant to the Act. In our view, the standards were set without regard to the scientific basis for the limits imposed or their cost effectiveness. I am submitting with this testimony, for the record, a paper prepared by Consol which deals with this question.

There will shortly be an opportunity to amend the provisions of the Clean Air Act and the nature of these amendments could have a marked effect either for better or for worse on the marketability of Illinois Basin coal. It is hoped that no steps will be taken—especially in view of the adverse effect on employment and the economy—which would lead to further coal imports into the region which is richly endowed with coal resources and should be a net exporter rather than a net importer of coal and energy.

Partly because of the precedent of U.S. sulfur restrictions, it is not surprising that as we have restricted the use of Illinois coal in its home region we find that other countries are reluctant to accept it. Consol has recently prepared a survey of the European steam coal market. It is estimated that European steam coal imports will increase from a 1980 level of approximately 83 million metric tons to 96 million tons by 1985 and 165 million tons by 1990. In that year, we estimate that only 7 percent of the import requirement will be for coals of a higher sulfur content than 2 percent.

This would seem to limit the market for coal of the type found in the Illinois Basin to about 12 million tons in Europe in 1990. However, this market would have to be shared with Northern Appalachian coals which have a transportation advantage to Europe.

These economics exclude consideration of demurrage caused by east coast port congestion which is currently a substantial adverse factor in the economics of shipment of coal from the east coast of the U.S. and can add more than $10 a ton to the price. However, by 1990, we expect sufficient port capacity to be installed that congestion and thus demurrage will no longer be a factor, thus reducing the relative attraction of New Oreans and the Great Lakes ports as alternatives to the east coast.

Although this is an admittedly bleak picture for high sulfur coal exports, it is possible that it could change. Western Europe has been able to obtain low sulfur coal from its own production and from such exporting countries as Poland, South Africa, and Australia. It has also been able to obtain low sulfur coal from the United States. However, as we approach the 1990's with an increase in the volumes consumed, significant premiums may develop for low sulfur coal in order to shift some volume from the metallurgical coal market to the steam coal market. This could be enhanced if the Clean Air Act is amended to reduce the scrubbing requirements for low sulfur coal for new plants. This low sulfur premium may encourage European buyers to look at the blending of coals to reduce cost. For example, it may be feasible to blend Illinois Basin coal in LeHavre, Rotterdam, or other large import terminals.

A second development which could increase the acceptable level of sulfur content would be the installation of scrubbers on utility plants in Europe. In the Federal Republic of Germany, a new utility plant of more than 400 MW will be required to install scrubbers. However, these may be one stage scrubbers designed to accept only 1.5 percent sulfur coals, and this would not materially assist the development of markets for higher sulfur coals. We hope that European buyers could be encouraged to increase their supply flexibility by installing desulfurization equipment, which would permit them to use a wider variety of coals.

Another development which could lead to the acceptability of high sulfur coals would be the introduction of fluidized bed combustion technology. A consolidation Coal Company affiliate, the Conoco Coal Development Company in conjuction with Stone and Webster, has developed a process in the pilot plant stage which can remove 90 percent of the sulfur contained in the coal. This plant is most suitable for industrial application and we hope to install a commercial-sized version in the near future. This process and similar ones which other companies are working on could expand the market for high sulfur coal in Europe and in the United States. However, the effect of the process on volume requirements will not felt until the 1990's and then principally in the 25 percent of the market which is non-utility use.

Another possibility for expanding high sulfur coal exports will be the introduction of gassification processes which could be used for the manufacture of natural gas as substitutes and methanol. There is likely to be a market in the 1990's with perhaps some initial units being built and brought into operation before 1990. While such units may utilize 1.5 million to 3 million tons a year each, there is unlikely to be more than a few built in Europe during the next 15 years. A variant of this possibility would be to establish methanol plants in the United States to export the methanol instead of the coal.

The role of coal in the European energy picture in the 1990's will depend on many factors, including the relative price relationships which develop for coal and oil, the future of nuclear, and the development of technology. A key factor in the equation will be the ability of the United States to provide coal at a competitive price and make it available through efficient ports dredged to accept large vessels and built with sufficient capacity to avoid demurrage. It will be necessary for the United States to keep its costs under control with respect to severance taxes, environmental regulations, waterway and rail transportation rates, and labor and other production costs. Given a favorable environment the European import requirement could grow to between 250 and 300 million tons per annum by the year 2000. The import of coal in this volume will require the acceptance of higher sulfur coals. By that time, desulfurization technology will be sufficiently advanced. Moreover, at this point the volume of U.S. exports will have increased to a level at which a substantial percentage will need to come from the Illinois Basin through the Gulf ports. Thus, the prospects of high sulfur coal exports from the Illinois Basin in the late 1990's would appear to be encouraging.

I have concentrated on Europe in this review because this market will be by far the largest steam coal export market for U.S. coal. There will be some small volumes required in the South American market and the Pacific Rim countries in the Far East. These are estimated to require 100 million metric tons in 1990. However, it is unlikely that more than a small volume of this will be U.S. coal because of the competition from closer sources, such as Australia and China, and from Canada, South Africa and Columbia. Some 5 million tons of U.S. coal may move from the West through Long Beach, and some marginal volumes will move out of New Orleans, though not more than 2–3 million tons. Because of the low sulfur content of much coal reaching Pacific Rim countries, it is possible that some of this could be high Btu, high sulphur coal for blending.

In order to advance the date at which substantial export volume from the Illinois Basin occurs, the United States Government can take steps to influence the outcome. First, it can set an example to the rest of the world by basing air pollution standards on the best available scientific evidence. The Clean Air Act needs to be modified and streamlined with this in mind. Second, Government can support the development of desulfurization technology, including fluidized bed combustion technology. Third, ports should be dredged to permit the use of large vessels to reduce the cost of transporting coal to foreign markets.

RESPONSES OF MR. COPE TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY

Question 1. It is clear that what foreign buyers are looking for most of all from their coal suppliers is a reliability of supply. The brief period of time allotted you in the hearing precluded my asking you a very basic and fundamental question: Does your company have coal to export? Please indicate the amount and approximate location of your available reserves, if possible. If your company was to have a sudden surge of domestic demand for your coal, would there still be available reserves to meet the demands of foreign buyers?

Answer. Consolidation Coal Company has more than 15 billion tons of U.S. reserves so that we do have enough coal to meet the demands of foreign buyers as well as foreseeable domestic demands. Were there a requirement for it we could export coal from our Burning Star mines currently in production in Southern Illinois as well as develop new reserves. However, the problem at the moment is that it is difficult to find foreign buyers for high sulfur high volatile coal. The situation may change in the next decade with advances in desulphurization technology.

Question 2. Your testimony touched in part on some of the many inherent advantages which Illinois coal enjoys—the productivity of Illinois mines, Illinois' access to ideal transportation, etc. How can the word best be spread to foreign buyers about the advantages of Illinois coal? What do you and your company expect to do to "get the word out"? What should be the role of state and federal government?

Answer. Government could best aide U.S. coal exporters by:

(a) taking early steps to dredge ports

(b) putting on technical seminars for foreign buyers to assist them to a better understanding of what the U.S. has to offer

(c) stimulate desulphurization research

(d) create conditions for the greater use of high sulfur coals in the U.S. as an example for foreign markets.

Question 3. How quickly could your company commence large-scale shipments of Illinois coal to Europe or the Pacific Rim? Are there logistical problems which affect Illinois coal in particular and which must be overcome before large amounts of Illinois coal can be shipped overseas?

Answer. We do not think logistical problems impede exports of Illinois coal. The main problem is that high sulfur coal is not much in demand. High sulfur Eastern coals have the advantage of high Btu content. There has been some interest in coals from New Orleans because of East coast demurrage problems but this advantage will disappear in a few years when East coast port capacity is expanded.

Question 4. How and when did your company first become interested in the export market for Illinois coal?

Answer. During the last two years we have opened negotiations in all the important potential markets for U.S. steam coal. To date we have not sold any Illinois coal but we have offered it where it would meet buyers' requirements.

RESPONSES OF MR. MILLER TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY

Question 1. It is clear that what foreign buyers are looking for most of all from their coal suppliers is a reliability of supply. The brief period of time allotted you in the hearing precluded my asking you a very basic and fundamental question: *Does your company have coal to export?* Please indicate the amount and approximate location of your available reserves, if possible. If your company was to have a sudden surge of domestic demand for your coal, would there still be available reserves to meet the demands of foreign buyers?

Answer. Marine Coal Sales, Inc. is a wholly-owned subsidiary of Pott Industries, Inc. which in turn is owned by Houston Natural Gas Corporation. HNG also owns Zeigler Coal Company which is a major producer in Illinois and has reserves in Illinois of more than one billion tons. Marine Coal Sales is responsible for the export of Zeigler's production as well as other coals in other states.

Marine Coal is currently exporting 1.5 to 2.0 million tons per year thru Gulf ports. Approximately 600,000 tons is mined in Oklahoma and moves to tidewater thru New Orleans, LA and Port Arthur, TX. These coals are purchased under long term agreements from coal producers. The remaining export tonnage originates in Kentucky, West Virginia, Indiana and Illinois and is purchased from mining companies under long term agreements and is transported to the Gulf by river barges by Federal Barge Lines, another HNG subsidiary company.

Marine Coal Sales has additional coal available for export in the states outlined above. We have demonstrated to European and Asian buyers that we are reliable suppliers. A sudden surge in domestic demand for coal would not preclude current export shipments from being maintained and increased.

Question 2. Your testimony touched in part on some of the many inherent advantages which Illinois coal enjoys—the productivity of Illinois mines, Illinois' access to ideal transportation, etc. How can the word best be spread to foreign buyers about the advantages of Illinois coal? What do you and your company expect to do to "get the word out"? What should be the role of state and federal government?

Answer. I think foreign buyers are aware of the availability of Illinois coal and its advantages in the market place. At the same time, Illinois coal possesses quality characteristics which preclude its use in certain markets. Briefly, these are the level of sulfur content, the high volatile matter level, the relatively lower heating value and the low fusion temperatures of the ash. The low ash fusion temperatures are an advantage when the buyer is looking for fuel for wet-bottom boilers but precludes its use in dry bottom furnaces, the system most often used in new power plants.

Our company and others are actively promoting Illinois coals in the export market. I don't feel that a state or federal government program is necessary or desirable.

Question 3. How quickly could your company commence large-scale shipments of Illinois coal to Europe or the Pacific Rim? Are there logistical problems which affect Illinois coal in particular and which must be overcome before large amounts of Illinois coal can be shipped overseas?

Answer. I believe our company and others in Illinois could begin shipping large amounts of coal to the export markets very quickly. Mines and yet to be developed reserves in the state are adequately served by efficient rail systems and there is more than sufficient rail-to-barge loading terminals located on the Ohio and Mississippi Rivers. A deeper port at New Orleans would enhance the overall export economics but the current capabilities in the Gulf do not constrain the movement of Illinois coal.

Senator PERCY. Next will be the Panel Session 4, High Sulfur Coal Transportation Factors.

I would like to mention that Len Gardner of the Illinois Agricultural Association, will be submitting a statement on coal production for the record and we will insert it after the prepared statements of this panel.

Len has very thoughtfully indicated that, in view of the pressure of time, he will not take the time to read his remarks now, but will submit them. Illinois' farmers want to remind us all of the need to insure that prime farm land, after coal mining operations have been undertaken, will be restored to prime condition.

Our first witness will be Mr. Harry Bruce, senior vice president for marketing of Illinois Central Gulf Industries. Mr. Bruce, we welcome you.

TESTIMONY OF HARRY J. BRUCE, SENIOR VICE PRESIDENT FOR MARKETING, ILLINOIS CENTRAL GULF INDUSTRIES; HERBERT R. HAAR, JR., ASSOCIATE PORT DIRECTOR, PORT OF NEW ORLEANS; AND JOHN C. MARLIN, DIRECTOR, CENTRAL STATE RESOURCE CENTER

Mr. BRUCE. Thank you, Mr. Chairman. Much has been said of export coal in recent months, but little of this attention has focused on the Illinois basin and its coal.

The subcommittee is to be commended for its recognition on the potential contribution of the Illinois basin to reducing U.S. balance of payments deficit and alleviating the world's energy situation, as well as the economic prosperity of the area. At the Illinois Central Gulf, we believe strongly in the export potential of the Illinois basin's enormous coal reserves.

Let me say at the outset that the Illinois Central Gulf, unlike many transportation companies, owns neither coal mines nor reserves. The focus of our export coal activity has been and continues to be the land transportation link between mine-mouth and ship-berth, and I would like to underscore that mine-mouth to ship-berth, because this is somewhat unique and different, it's a first for a railroad competing with the inland waterways to be able to make such a statement. The viability of this link depends upon the export potential of Illinois basin coal.

Any evaluation of this potential must be viewed from the importer's perspective. The ICG has expanded a great deal of time, money, and human resources in evaluating the needs and concerns of potential importers. Simply put, there are two fundamental questions. One, do Illinois basin coal specifications suit the importers' requirements, and two, is the intended cost of landed Btu's competitive and acceptable? The ICG has determined that the answer to both questions is a resounding "Yes!" We believe that our own studies of the situation are sufficiently thorough and the results sufficiently realistic to varify the export opportunity.

There is a common belief that Illinois basin coal will not satisfy European coal buyer specifications. To determine the accuracy of the belief, we collected and analyzed data that would either corroborate or refute this belief. In addition to well-known studies, such as MIT's World Coal Study, ICG conducted its own study of the basin, it's coals and probable international opportunities for these coals. Some of the Illinois basin coal that we serve is higher in sulfur content than is generally accepted under current U.S. Federal regulations. But that isn't necessarily a major deterrent in dealing with the European market, where existing and pending regulations vary not only by country and region, but even by industry.

The term "high sulfur" also begs for closer examination. "High" as compared to what? We could go on at great length discussing the merits of one nation's or one region's steam coal properties, that is not the critical issue. What is important are the international market specifications, sulfur content is only one of the several specifications in the demand equation. The important point is that there are European markets that Illinois basin coal can readily satisfy. We are continuing to fine-tune our focus on Europe by commissioning indepth market studies on a country by country basis. We began with Spain. The results of the study indicate that Illinois basin coals are both usable and acceptable, sulfur, notwithstanding. This is particularly true in the Spanish Cement Industry where up to 2½ percent sulfur is readily acceptable. The Spanish study pinpointed specific utilities and cement plants, both existing and planned, port facilities, coal import and demand projections, coal procurement procedures and the national energy plan of Spain. We believe that we have established the existence of an Illinois basin coal market in Spain.

A similar study of the Italian market has just been completed and a study of Greece has been commissioned. ICG has made the results of the Spanish study available to interested Illinois Basin coal producers, and plans to do so with both the Italian and Greek studies. The cost competitiveness of Illinois Basin coals in the international market place is also shrouded in myth. As you might expect, the ICG examined this subject very carefully, since we hope to be one of the transport links between Illinois and Europe, as well as the rest of the world. As responsible businessmen, potential importers look at total cost, the cost of land Btu's.

Thus, we viewed Illinois Basin coals from a similar perspective, using the port of New Orleans as the exit port. Preliminary information on other perspective European import countries has yet to reveal weakness in Illinois Basin coals for cost of distribution.

However, there is a problem that must be solved before the Illinois Basin ports begin. In conducting our studies of the European market, we found that only Appalachian coal was thought of when U.S. coal is mentioned. Europeans see the Eastern United States as a coal supplier, but see little beyond eastern Kentucky. It is as if the mountains of eastern Kentucky form a wall or barrier that obstructs the European view of the Illinois Basin. Unfortunately, this myopia extends even to the Federal Railroad Administration, which for the most part, ignored potential Illinois Basin coal exports in its projection of "Railroad Freight Traffic Flows 1990."

As it may be obvious, the most pressing need that must be met before Illinois Basin coal exports become a reality is a massive effort to educate and inform, and much has already been said on that front this morning, and we support that entirely. This effort must be coordinated among railroads, coal companies and ports. For its part, the ICG has and will continue to act as a catalyst and strategist in bringing together potential importers and coal producers through a five-point program by: First, speaking out in behalf of the Illinois Basin as opportunities arise, Second, providing informational materials, such as the Import Coal Guide now being prepared by the ICG, Third, circulating the results of our country by country market studies to interested Illinois Basin coal producers, Fourth, working with ports and coal producers to develop transportation price packages attractive to potential importers, and Fifth, supporting efforts to modernize as well as develop port facilities to meet future needs. The subcommittee's support and any assistance you might render in this educational effort will certainly be welcomed, Senator. Thank you very much.

Senator PERCY. Thank you. Mr. Bruce, a very nice speech.

Colonel Herbert Haar is the associate port director to the Port of New Orleans. He served in the Army Corp of Engineers in New Orleans, as well as in the District of Columbia, Thailand, Peru and Nicaragua. Colonel Haar serves as Chairman also of both the American Association of Port Authorities and the International Association of Ports and Harbors Ad Hoc Dredging Task Force. Colonel Haar?

Mr. HAAR. Thank you, Mr. Chairman. The Board of Commissioners of the Port of New Orleans is a strong advocate for the deepening of the southwest pass of the Mississippi River and for a 55-foot-deep channel all the way to Baton Rouge, a distance of some 234 miles. The total waterborne commerce, foreign and domestic, of the Mississippi

River below Baton Rouge was 572 million tons in 1978. This is 28 percent of the Nation's total waterborne commerce.

Louisiana deepwater ports handled over 20 percent of all the Nation's foreign commerce in 1979. I might also mention that 40 percent of the Nation's grain, some 50 million tons, was exported from the lower Mississippi River in 1980.

Additionally, if you look at the entire lower Mississipppi River, the deepwater ports from Baton Rouge to the gulf, when we talk, first, of New Orleans being the No. 1 in the Nation and the No. 2 port in the world, and we look at that whole complex from the gulf to Baton Rouge, we are looking at a complex that moves tonnage figure that I have mentioned of almost twice that of the biggest port in the world.

Now I'd like to speak more in detail to that lower 234 miles of the Mississippi River, that's where all the coal action is taking place today. Today there are three existing terminals that are being upgraded on a major basis. Additionally, there are seven new terminals that are under design and will be going on line in the next 2 to 3 years with further expansions planned in the 1988 to 1990 timeframe. These facilities are all being constructed by the private sector. They involve an expenditure of over $800 million. These 10 terminals, and I haven't included them all in my testimony because several additional ones have been announced since I put my data together, these 10 terminals will have a throughput capacity in 1983 of 60 million tons and in 1990 of 144 million tons.

In addition to these figures, we have midstream loading capabilities by four major stevedoring firms in the New Orleans area of 24 million tons per year by the end of next year. Now if you add this to the previously mentioned 60 million tons from the new terminals being developed on the shore, you have a 84 million ton capability of coal throughput in the New Orleans area in 1983 and 168 million tons throughput in 1990. This all represents tremendous capability that's going on line by the private sector. The total private investment by 1990 will be over $1 billion.

Now, another interesting thing about these terminals going on line in the lower Mississippi River, is that they have huge amounts of land that go with them. The existing terminals, two of them have 800 acres already owned, one new terminal that is in the new category—Jerry Cunningham is going to be on the panel tomorrow and is going to address this—has just purchased 2,000 acres on 2½ miles of waterfront. Now what is the significance of this? The significance of this is that ships will not have to wait. In other words, there's lots of land there and most of these terminals are in rural settings. where there'll be adequate barge fleeting areas. There will also be adequate ship berths and there will be deep water available so that waiting time like you have had on the east coast will be nil. I think that's why you see all this dramatic action—because of the great Mississippi River system that we have. So, I think the tremendous initiatives to build these new terminals on the river is all indicative of a very optimistic view of what the private sector perceives the future to be for coal exports from the lower Mississippi River.

Now the only missing link in all of this is a deeper channel for the lower Mississippi River, and I might mention that lower 234 miles to the Mississippi River is 100 feet deep from New Orleans to the gulf. The only place where you have a problem is the last 21 miles in Southwest Pass, which forms a delta and a lot of the silt drops at that point. This involves lots of dredging, so you have a 40 foot channel at that point, and at some 12 or 13 crossings over the entire 234 mile deeper section where the river changes direction, you have dredging requirements. Therefore the technical problem of accomplishing the dredging and deepening of the lower Mississippi River is relatively easy.

Now the big thing—the fast track legislation which we're endorsing, we have worked closely with Senators Johnston, Long, and Warner on this—is the fast tracking of the environmental impact statement procedure and the litigation process.

Also in the cost recovery aspect, we are against it in principle, but we recognize the administration and Congress are in the mood to go forward with it, therefore, we would recommend 25 to 50 percent for construction cost recovery, and the same for operation and maintenance recovery charges. We would certainly hope that the Congress in its wisdom can see fit to pass an appropriate piece of legislation by the end of this September, and with your strong interest, Senator, I know we can count on your full support in this effort. Thank you very much.

Senator **Percy**. Thank you, Colonel, very much indeed.

Our final witness in this panel is Dr. John C. Marlin, director of the Central States Resource Center. The Central States Resource Center is an environmental interest group concerned with water and farm land preservation. Dr. Marlin received his Ph. D. in entomology from the University of Illinois in Champaign—Urbana. Dr. Marlin?

Dr. Marlin, I'll have to step out for just a moment for a quick telephone call. I'll have Congressman Paul Simon Chair for just a moment. Thank you.

Mr. **Marlin**. There is no compelling environmental reason why the United States, in general, and Illinois, in particular, cannot become a major supplier of the world's coal. Given the current unstable nature of the free world's sources of oil and coal, it is essential for world peace that dependable energy supplies be found. If the development of coal export facilities proceed with sensitivity to social and environmental concerns, there is little reason to expect trouble from major environmental organizations. By this, I mean the facilities must be needed, economically justified, and located to cause a minimum of environmental danger.

The main concern of the environmental organizations is the haste with which regional economic interests are rushing to authorize dredging of their favorite ports to a depth of 55 feet. The many bills introduced to speed development and elude environmental regulations are ample proof of this.

The majority of the Nation's major riverine estuaries and many coastal wetlands will be lost forever if all potential ports are developed. There is a need to develop port capacity, there is no need to develop all ports. The dredging of deep ports will create a number of environmental costs. First is the physical disposal of dredge spoil. Placing it in wetlands destroys thousands of acres of irreplaceable habitat that forms the foundation of our marine fishing industry and of recreational hunting and fishing. Disposal in dike areas or at sea are other alternatives which require study to determine their potential impacts.

Spoil often contains toxic chemicals and heavy metals that are reintroduced into the water when stirred by dredging. For this reason, care must be taken to understand the chemical nature of spoil from individual sites before it is moved. Changing the hydrologic characteristics of river outlets by deepening or relocating can cause saltwater intrusion which destroys habits and pollutes sources of municipal and surface ground water.

Altering the dynamics of sediment transport could have long-term impacts on the stability of the coast and barrier islands where erosion is already a problem.

There is an appalling lack of comprehensive data on the impact of navigation on the dynamics of aquatic ecosystems, and we strongly recommend that studies be undertaken to develop a good data base which will take much of the guesswork out of environmental impact statements and help speed things up. Many potential environmental problems could be eliminated or apparently be eliminated by locating facilities offshore and moving coal to them by small ships or conveyors. The beneficiaries of any port or channel deepening efforts should pay the cost of the work. If users pay the fees, the developments will be promoted because they are needed.

Far too much environmental damage has already occurred because the Federal Government has paid the cost of river projects in the past. Much attention has been given to improving the inland waterway system to move export coal. It should be remembered that the Government currently pays more than 40 percent of the cost of moving freight by barge on the inland waterway system. The greatest beneficiaries of this subsidy are coal and oil companies which move over half the tonnage on the Mississippi system.

The environmental community is greatly disturbed at attempts by some to blame environmental regulations for project delays and the Nation's economic ills. If the average water project takes 24 years to complete, it cannot be due to environmental laws that existed for less than 10 years. A study of the various records of the past 50 years will show the primary problem here is the authorizing and funding process in the political game played by regional interests, that's your major source of delay.

Environmental regulations have something to do with the decrease in productivity in the coalfields, however, as the General Accounting Office has pointed out, the decisions and desires of management and labor have a lot to do with the industry's woes. I would add to this list, a long history of Government policies that left oil, gas and nuclear energy under priced in relation to coal.

The public interest in river and wetlands and clean air and clean water must be protected. If industry moves with these values in mind, there will be much less controversy. The cost of reclaiming land, cleaning the water and keeping the air breathable must be seen as a normal cost of doing business.

At this point, let me acknowledge that not all environmental regulations are justified, and I am sure some can be changed. However, attempts to circumvent the intent of the environmental laws will be strongly opposed and eventually turned back.

I'd like to offer several suggestions to help speed things up and perhaps lessen some of the fighting that's gone on about developments in the past. First, I would suggest that we examine port development alternatives in light of economic and ecological realities and determine if ports should be dredged, or if offshore loading facilities should be developed. Second, we should select one project on each coast to develop while additional studies are conducted. Third, we should begin and complete studies of the impact of navigation and dredging on environmental resources, particularly in the coastal areas. Fourth, cost of environmental protection should be considered a normal cost of doing business.

Shippers should be required to pay the cost of constructing new facilities. We should eliminate differential subsidies between various modes of transportation, and when the potential problems and benefits are better understood and a firm demand for export coals established, we should then proceed with additional projects as needed.

There is a future for coal exports which can develop rather painlessly if those involved decide to cooperate in an atmosphere of give and take, based upon sound economic and ecological principles. The alternative is decades of fighting and many losers.

Senator PERCY. Thank you very much, Dr. Marlin.

Mr. Bruce, in your statement you made it very clear that ICG Railroad is expecting to play a major role in coal exports in the coming years. What has your company done to improve the roadbed and increase its hopper car supply in preparation for the expected increase of coal exports?

Mr. BRUCE. We have been getting ready for this from a couple of different standpoints. The past 5 years, we have expended over $1 billion on our right-of-way—our main line—and in that same framework, we have also identified on the specifics of coal, the need for equipment, not only for domestic transportation, but also for the coming eventuality of the export program that we have put together. We have expended somewhere in the neighborhood of $140 million on 4,000 new coal hopper cars over the past 5 years.

More specifically on the immediate situation, as a result of our programs and working with the coal producers, we have 400 brandnew cars up the line at Centralia ready to move to the mines to to be ready to ship down to the New Orleans port for export. We are ready for the export coal market.

Senator PERCY. Very good. At this time, I take great pleasure in announcing the presence of Lt. Gov. David O'Neal. I wonder if the Lieutenant Governor would mind joining us right here at the podium. He won't be expected to give a speech. Thank you.

Colonel Haar, I understand that the Port of New Orleans is now the busiest in the country, with 167 million tons of cargo passing through it yearly. The second busiest port, the port of New York, carries 163 million. The advent of coal exports from the Illinois basin, which really haven't begun yet, may place considerable strain on your port in the near future.

Do you feel that the Port of New Orleans will be able to deliver ample amounts of high sulfur coal in the short term, even though it is not yet expanded to an optimun size?

Mr. HAAR. Mr. Chairman, I might mention that the Port of New Orleans has been monitoring the coal activities, and we probably will have only the one terminal that we have leased to a steel firm that will move some in ICG Railroad coal from Illinois. Most of the other terminals projected to be developed outside of the port limits, per se, so that in four public port authorities on the lower Mississippi River, these are spread primarily in the lower river and the upper reach of the river, the new terminals projected to go on line.

Now the Coast Guard, in connection with improved vessel traffic safety, has been conducting a study through the Louisiana State University as an agent with all authorities involved as to how to improve the vessel traffic system to provide for increased safety on the lower river.

Also, the Governor and the legislature is in the process of establishing an ad hoc committee at this time, in fact, my boss and I just met with the Governor's representative on this last week, to discuss what needs to be done and what efforts that we should take to supplement even the work that's going to be accomplished and the safety to be accomplished by the vessel traffic system in this regard. So I think that the State of Louisiana and the public ports involved are looking forward to taking all measures that will be required to be able to adequately and safely handle this increased volume on the lower Mississippi River.

Senator PERCY. Thank you very much.

Mr. Marlin, I think your presence here is terribly important. It has been argued by some that environmentalists are just obstructionists, something they would like to sweep away. I think, also, we must give credit to the fact that most environmentalists are reasonable, practical people who recognize the need for balance in life. I know your comments today are valuable. The environmental consequence of river port expansions have to be taken into account at all times.

At the same time, we need more coal exports. I am delighted to hear that you support coal exports, and I am especially glad to hear you say coal exports can be done without endangering the environment. Could you tell us, do you have any suggestions you can make to industrial and environmental organizations to insure that environmental concerns are built into the process to help increase coal exports and are not obstacles or causes of delay in coal exports?

Mr. MARLIN. I think the first thing that you have to do is to start talking to each other. Most of the industry people I know who have environmental sensitivity are looked upon with suspicion by their colleagues, and people like myself who believe in little compromise have certain problems with our own radicals. But, I think we ought to start recognizing that the environmental interests and economic interests have to start talking and finding solutions. As I point out in my opening, I think that world stability depends very heavily on us getting our act together. And I'd much rather spend my time solving problems than fighting with coal companies.

I think the biggest obstacle that I can see happening right now is that the major national environmental groups watch the legislation being proposed in Washington which is going to open up the door for the development of almost any port of the Corps of Engineers think is economically feasible. In political terms, that means every

Senator and Congressman with a port is going to try and get his own port deepened. And as I point out, we run the risk there of creating a panic situation nationally where almost every river estuary in the country comes under tremendous pressure. If we could pick a few ports to start with and save a prototype and work on those in a national manner, we can eliminate a lot of panic and fear that's going to create a big fight very soon. I just think we are moving on too many ports too quickly, and we'd be much better off to take a few and, as needs develop, go ahead and develop more and solve our problems along the line.

Senator PERCY. Thank you very much indeed.

I am going to think of this morning many, many times in future years, particularly at 3 or 4 or 5 in the morning after I have listened to 19 hours of filibuster and gotten nothing done. We have accomplished a great deal this morning, and if you look at your schedule, you will see that we are right on schedule, on a very crowded morning. I want to thank every single witness. I wish you were serving with me in the U.S. Senate. We will, incidentally, submit many more questions to you for the record, with your permission.

[The prepared statements of Messrs. Bruce, Haar (with attachments), Marlin, and Gardner follow. Responses to written questions submitted by Senator Percy to Messrs. Bruce, Haar, and Marlin also follow:]

PREPARED STATEMENT OF HARRY J. BRUCE

Mr. Chairman and members of the subcommittee, on behalf of the Illinois Central Gulf Railroad, I thank you for the opportunity to participate in today's hearing.

Much has been said of export coal in recent months, but little of this attention has focused on the Illinois Basin and its coals. The subcommittee is to be commended for its recognition of the potential contribution of the Illinois Basin to both reducing the U.S. balance of payments deficit and alleviating the world's energy situation, as well as the economic prosperity of the area. At the Illinois Central Gulf, we believe strongly in the export potential of the Illinois Basin's enormous coal reserves.

As anyone who has read the MIT World Coal Study knows, world trade in steam coal is expected to explode from 73 million tons in 1978 to as much as 800 million tons by the turn of the century. The Illinois Basin has 215 billion recoverable tons of coal reserves, largely steam coal. It represents one of the largest reserve areas in the United States, and the majority of these reserves are served by the ICG.

The ICG sees coal—especially export coal—as one of its biggest growth commodities. To many, that statement may seem ironic coming from what is erroneously thought of as a north/south "granger railroad," whose role has been limited to carrying coal from the mines to midwestern utilities or to the nearest rail/barge terminal. Unlike other major coal carriers—and we are one of the 10 leaders—ICG's main line parallels the Mississippi River, which carries the nation's heaviest barge traffic. Conventional belief in the cost efficiencies of barge transport would seem to dictate that ICG leave export coal to the river and concentrate on domestic coal and other commodity movements.

But traditional thinking—at least, traditional rail/coal thinking—is going to change. The Staggers Rail Act is beginning to change many of the historic railroad commercial habits. The rails now have the full range of freedoms and flexibilities with which to innovate and to compete with barges and any other mode, for that matter. Successful marketing of U.S. coal abroad demands creative, aggressive methods. It isn't enough to jump on a plane, fly to Europe and tell a coal buyer that you can give him great turnaround time on unit train coal movements. Nor is it enough for coal companies, with limited preparation, to whisk piles of contracts off to Europe with little thought to the needs and characteristics of the international market. The name of the export market for railroads and coal companies alike is "landed BTUs."

As with any change, this one also requires a learning curve. This learning curve will include altering some well-intrenched attitudes. This is particularly true when we talk about exporting Illinois Basin coal, since its viability in international markets is surrounded by a peculiar mythology, considered fact by many.

Before debunking these myths, let me provide a frame of reference for my remarks and the ICG's optimism regarding the export market. Any discussion of any coal in the international marketplace is really a discussion of "landed BTUs." Thus, any evaluation of the international opportunities for Illinois Basin coal must include a thorough evaluation and assessment of each of the steps involved in delivering those BTUs—a system analysis of exporting Illinois Basin coal.

I should point out here that, unlike many transportation companies, the ICG owns no coal mines. The railroad's interest in the export market is simply to determine how the ICG might participate in the mine-mouth to ship-berth transportation of coal destined for export.

Each of the steps leading to the ultimate coal consumer has been subjected to systematic analysis by the ICG. Beginning with the characteristics and requirements of the export market, one must then blend in other steps important to a systematic approach: inland transportation options, port facilities for transshipping the coal, ocean transportation, destination ports, and the transportation options within the purchasing country.

Overkill? Not at all. The ICG first had to determine whether there was a profitable link in the distribution chain for the railroad. The customer, who is buying delivered BTUs, is financing the capital structure of the entire distribution chain. The ICG could provide the best, most economical service from mine-mouth overseas beyond our control, that last link is crucial to the viability of the whole chain. Or still, if the coal doesn't meet the buyer's specifications, the best transportation system in the world isn't going to convince the importer to buy.

Obviously, the ICG has determined that exporting Illinois Basin coal represents a major opportunity for the ICG. The ICG has devoted a great deal of time, money, and human resources to making sure that opportunity is real, rather than an export fantasy engendered simply by reading the World Coal Study. The railroad believes that its studies of the situation are sufficiently thorough and the results sufficiently realistic to soundly debunk the mythology mentioned earlier. Let me take you through each of the myths and show you the facts the ICG analysis uncovered.

First, there is a common belief that Illinois Basin coal will not satisfy European coal buyers' specifications. The fact is that Illinois Basin coal is acceptable.

To determine the accuracy of the belief, ICG began collection available data that would either corroborate or refute the statement. The market analysis began with MIT's World Coal Study, the first authoritative assessment of the world market and its needs. But the WOCOL study is a macroscopic view of the world marketplace and merely provided clues to specific areas that were examined in greater detail.

To focus more clearly on specific international opportunities for Illinois Basin coals, the ICG conducted its own study of the Basin, its coals, and probable international sales prospects for those coals. (Excerpts of this study appear in Appendix A.)

Some of the Illinois Basin coal served by ICG is higher in sulfur content than is generally acceptable under current U.S. federal regulations. But that isn't necessarily a major deterrent in dealing with exports to Europe.

The term "high sulfur" begs for closer examination. High, compared to what? One could go on at great length discussing the merits of one nation's or one region's steam coal properties. That is not what is important. What is important are the international market specifications. And sulfur content is but one of several key specifications that go into the demand equation. The important point is that there are markets abroad seeking coals which coal suppliers in the Illinois Basin can readily satisfy.

Currently ICG is fine tuning its focus on Europe even further, by developing in-depth studies of prospective buyers on a country by country basis. The first to be completed is Spain. The results of that study indicate that Illinois Basin coals are both usable and acceptable sulfur notwithstanding, to both the private-enterprise utility and cement industries in Spain. Cement industry sources indicated that coal with up to two-and-one-half percent sulfur is readily acceptable. In the utility industry, there are several environmental initiatives under consideration that will make the Illinois Basin coals viable in this market.

The Spanish study didn't stop with determining the acceptability of Illinois Basin coals. It also pinpointed specific utilities and cement plants—both existing and planned—port facilities, coal demand and import projections, Spain's infrastructure for receiving and handling coal, coal procurement procedures, and an evaluation of the National Energy Plan of Spain. The ICG believes that it has verified the existence of an Illinois Basin coal market in Spain. The ICG has conducted a similar study of the utility and cement industries in Italy, and has commissioned a study of potential Greek markets. The results of these studies are being made available to interested Illinois Basin coal producers.

Since there is an international market for Illinois Basin coals, let's look at the next link in the export chain—transportation from the mine-mouth to the ship-berth. This link also is surrounded by myth, namely that, "Illinois Basin coal must move by barge to Gulf ports." Perhaps this myth has persisted because river water looks cheaper than welded steel rail. The fact is that the ICG can be totally competitive with barge transport from mine-mouth to ship-berth.

The natural tendency is to look at barge rates and rail rates, see the lower figure on the barge side, and say, "We better go by barge, it's cheaper." What those barge rates don't show on the surface are a number of "hidden costs."

For example, the barge rates don't include the mine to river transport costs, nor do they include the extra handling costs or product loss caused by transfer from rail or truck to barge. They also do not include heat value losses associated with lengthy exposure to snow or rain. Fast, efficient, unit train movements are reliable regardless of low water levels, ice jams, or congestion.

More important even than these factors is the flexibility the Staggers Act of 1980 has provided to aid railroads in developing and pricing the inland transportation segment of the coal export chain. This new flexibility has given us the wherewithal to work with coal producers and prospective importers to develop an energy delivery package that is beneficial to all concerned. The Act legitimized contract rates; it established new more flexible pricing procedures that enable railroads to respond quickly to competition in the marketplace.

For example, just prior to the passage of the Staggers Act, the ICG secured a new flexible tariff that permits it to change price on coal movements from Illinois to the Gulf on two days notice to any point in a range between $16.50 and $11.25 per ton. This allows ICG to position itself to relative to barge competition in the market. Because the ICG secured the tariff before Staggers, we are the only railroad that has it. Of course, barges are talking in excess of $6 to $7 per ton, but remember the hidden costs I mentioned a moment ago. The rail link in the chain represents one price from mine-mouth to ship-berth, all inclusive.

As you might imagine, the ICG took an especially hard look at this link and the economics involved, since it governs the profitability of ICG export coal movements. I can say without fear of contradiction that the railroad believes there is an exceptional opportunity for the ICG and its customers in mine-mouth to ship-berth coal movements. We need only debunk the myth by shipping our first unit train of Illinois Basin coal to the Gulf for export.

The third link in the export chain centers on port facilities, and it, too, is surrounded by myth. This myth says, "There is no Gulf port facility to transload coal from rail to ship." This one has become myth only recently. Until five months ago, the statement was essentially true. In mid-January, however, an operating contract for the Public Bulk Terminal in New Orleans was awarded to Ryan-Walsh Stevedoring Company. I'm proud to say that our testimony on behalf of Ryan-Walsh and the export potential of Illinois Basin coal helped revive the Bulk Terminal.

This facility is fully operational. The rennovation work on the terminal permits it to readily handle up to four million tons of Illinois Basin coal per year. The Ryan-Walsh Bulk Terminal has an unloading rate of approximately 1,200 tons per hour, blending capabilities, ample ground storage, and rapid ship loading—about 1,200 tons per hour.

But the Ryan-Walsh Bulk Terminal will provide only interim rail to ship transloading. Its limited capacity is insufficient for the amount of coal that should be moving into international waters from the uncongested, warm weather Port of New Orleans. Nevertheless, it does give Illinois Basin coal an efficient, economical entre to world markets.

Currently, several organizations are looking at New Orleans area sites for a modern, rapid unloading coal-handling terminal with an annual export coal capacity of at least 20 million tons. The ICG is doing everything it can to help make that facility a reality, as soon as possible.

The fourth link in the chain is collier service to the importing country. Again, it is shrouded in myth, which says, "Ocean freight from New Orleans will be more expensive." Implicit in this statement is the assumption that more expensive means prohibitively more expensive. As pointed out earlier, the discussion is really one of landed BTUs.

First, ocean freight from New Orleans is only slightly higher than that from East Coast ports, exclusive of demurrage. However, extraordinary congestion at eastern ports makes additional Gulf coal handling capacity all the more appealing to the international coal market. Certainly, the demurrage charges—conservatively, seven to 10 dollars per ton—incurred as ships wait offshore for weeks on the East Coast more than offsets the slightly higher ocean freight rates from the Gulf to European destinations.

Not only does the use of New Orleans as the exit port eliminate the monumental East Coast demurrage charges, but it saves weeks of delay in shipping time, thus improving ship utilization. Outlined here are some of the estimates ICG developed when it assessed this link in the chain:

	Via gulf coast	Via east coast
Landed Btu cost (dollars):		
Coal price	$25.00–30.00	$28.00–33.00
Rail rate	12.00	13.00
Rail to vessel	2.50	.40
Ocean rate	12.00–14.00	11.00–13.00
Demurrage		7.00–10.00
Unloading	2.00	2.00
Total landed cost per net ton	53.50–60.50	61.40–71.40
Landed cost per million Btu	2.33–2.62	2.56–2.98

The ocean freight difference is estimated to be between one and two dollars per ton, favoring the East Coast. However, when all factors are considered, the situation shifts dramatically, putting the Gulf Coast in a more favorable light. The estimated cost per million landed BTUs in Rotterdam from East Coast ports came to between $2.56 and $2.98. From the Gulf Coast, the estimated range is $2.33 to $2.62. As you can see, ocean freight is not the proverbial weak link in the export chain.

The two final links in the chain are port facilities and the transportation systems of the importing countries. These are only two of the six links not shrouded in myth. Nevertheless, they both require careful examination in any assessment of market potential.

Our Spanish study examined both these subjects during the basic market analysis, and the results supported the existence of a Spanish market for Illinois Basin coal. For example, several of the new utilities being built in Spain will be very close to existing or planned port facilities. Current port facilities are adequate to handle Spain's import coal needs for the time being. New facilities are planned to provide the necessary additional capacity to handle future needs. The existing transportation infrastructure in Spain is also adequate to supply both cement plants and existing utilities with coal transportation services.

Preliminary information on other prospective European importing countries has yet to reveal weakness in either of these links in the chain. However, there is a problem that must be surmounted before the Illinois Basin exports begin.

Traditionally, Europeans who have purchased U.S. coal have purchased Appalachian coal and it has been shipped through our eastern ports. The coals have been adequate and the costs competitive with other world sources, such as South Africa, Australia, and Poland.

In conducting its studies of the European markets, ICG found that only Appalachian coal is thought of when U.S. coal is mentioned. Europeans see the eastern United States as a coal supplier, but see little beyond eastern Kentucky. For the most part, Europeans have heard little about Illinois Basin coals. The information they do have has come sporadically in bits and pieces, usually from a visit by a coal executive selling his company's products.[1] It is as if the mountains of eastern Kentucky form a wall or barrier that obstructs the European view of the Illinois Basin.

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[1] In the course of ICG commissioned research studies, the consultants also recommended a strategic outline for coal producers desirous of selling their products abroad. This outline is included in Appendix B and is available to interested Illinois Basin coal producers.

(Unfortunately, this myopia extends even to the Federal Railroad Administration, which for the most part, ignored potential Illinois Basin coal export in its projections of "Railroad Freight Traffic Flows 1990.")

As may be obvious, the most pressing need that must be met before Illinois Basin coal exports become reality, is a massive effort to educate and inform. This effort must be coordinated among railroads, coal companies and ports.

For its part, ICG has and will continue to act as a catalyst and strategist in bringing together potential importers and coal producers by:

Speaking out in behalf of the Illinois Basin as opportunities arise;

Providing informational materials, such as the Import Coal Guide which is now being prepared;

Circulating the results of our country-by-country market studies to interested Illinois Basin Coal producers;

Working with ports and coal producers to develop transportation price packages attractive to potential importers; and

Supporting efforts to modernize as well as develop port facilities to meet future needs.

The Subcommittee's support and any assistance it might render in this educational effort will certainly be welcomed.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO MR. BRUCE BY SENATOR PERCY

Question 1. Mr. Bruce, your statement makes it clear that ICG railroad is expecting to play a major role in coal exports in the coming years. What has your company done to improve its track and roadbed and increase its coal car supply in anticipation of the increase in coal traffic you expect?

Answer. Both the ICG physical plant and equipment fleet are in excellent condition. Combined capital and operating expenditures for maintenance-of-way and equipment over the past 10 years exceed $3.3 billion.

ICG is investing well over $100 million a year in a track upgrading and improvement program. Using its own funds supplemented by preference share financing secured from the Federal Government, the ICG maintains and upgrades its right of way including main freight lines and important branches. ICG uses sophisticated track and maintenance machines to install rail, crossties, and switches, to lay ballast, and to maintain existing track. Improved track structure continues to give ICG better equipment utilization.

In addition to good track, ICG owns more than 1,000 locomotives and 41,000 freight cars. The railroad's locomotive fleet has one of the youngest average lives and best availability percentages in the entire railroad industry. At its Paducah, Kentucky shop ICG adds 20 years to the life of locomotives through remanufacturing. At its car shop at Centralia, Illinois, ICG builds coal hoppers and rail cars of many other types. Also, at Centralia and at McComb, Mississippi ICG rehabilitates thousands of freight cars each year.

Question 2. Mr. Bruce, I understand that Illinois has over 11,000 miles of track, which are currently operated by nearly 40 railroads. Illinois, in fact, has perhaps the best railroad transportation system in the country. Do you feel that this system is fully capable of delivering high-sulfur coal to coal ports when it is needed? Why?

Answer. Illinois' rail network is certainly one of the nation's strongest and fully capable of delivering high-sulfur coal to virtually any U.S. port. Its strength comes the fact that nearly 90 percent of the nearly 10,000 route-miles in the state are owned by the 10 largest line-haul carriers in the country. Route-mileage is a measure of the right-of-way over which the railroads operate. It provides a more accurate picture of the relative size of different railroad companies, by excluding sidings, spurs, double track, yards, etc. If I may, I would like to outline for you the line haul railroads and route-mileage both in real terms and as a percent of Illinois' rail system:

Railroad company	Route mileage	Percentage of Illinois System
Illinois Central Gulf	2,445.1	24.51
Burlington Northern	1,386.5	13.90
Norfolk & Western	811.6	8.14
Conrail (Consolidated Rail Corporation)	854.1	8.56
Chicago Northwestern	837.5	8.40
Missouri Pacific (Includes: MP, CEI)	645.1	6.47
Atchison, Topeka & Santa Fe	515.0	5.16
Milwaukee Road (Chicago, Milwaukee, St. Paul & Pacific)	462.3	4.63
Chessie System (Includes: B. & O., C. & O.)	371.6	3.73
Louisville & Nashville	264.8	2.66
Rock Island System [1]	294.5	2.95
Total	8,888.1	89.11

[1] The Rock Island System is operated by several of the railroads on this list.

These 10 railroads also originate virtually all of the Illinois coal traffic, which moves in four major flow patterns:

1. North from Southern Illinois to Chicago ports and the Upper Midwest.
2. South from Southern Illinois to the Gulf ports in Louisiana and Mississippi as well as to Mississippi and Ohio River ports.
3. East from Southern Illinois to Indiana, Ohio, and points east.
4. West from Southern Illinois to Iowa, Missouri, and Kansas.

Nationally these ten railroads comprise almost 99,000 track miles and reach virtually every segment of the country as well as every port. There is no doubt that the Illinois rail transportation system is capable of carrying Illinois Basin coal to customers at home and abroad.

Question 3. Your testimony notes that ICG has undertaken an in-depth review of the potential which may exist overseas for Illinois coal. Can you tell me in a little more detail what ICG's activities have been in this regard?

Answer. As ICG began to examine the export potential of Illinois Basin coal, we found that the research done to date was macroscopic in perspective. Little attention had been devoted to identifying the specific coal requirements of industries or individual customers within importing countries. To fill this void and realistically assess the export potential of Illinois Basin coal, ICG commissioned in-depth field studies of Spain, Portugal, Italy, and Greece to determine coal specifications required and potential buyers for Illinois Basin coal.

These market studies served as a basis for ICG to ascertain the role it could play in the export market. The studies also included strategic recommendations for Illinois Basin coal producers entering the international marketplace, and were provided to the Illinois Basin coal producers who requested them. By sharing the results of our studies we hoped to stimulate producer marketing efforts abroad.

On October 2 in London the research team will present the cumulative findings of the four studies at the "Conference on Global Strategic Management in the 1980's." I am submitting a copy of that presentation with this testimony.

Question 4. On Tuesday, June 9, ICG and Freeman-United announced that they had just completed what is thought to be the first steam coal export contract involving an Illinois coal producer and a European purchaser. ICG will deliver the coal for this sale from mine-mouth to ship-berth. Can you describe ICG's specific obligations under this contract? How was your company able to assure delivery of coal from Illinois to the Gulf at a cost that was competitive with alternative modes of transport?

Answer. Although the specific contractual obligations for the coal are between Freeman-United and Aprocar (the Spanish purchaser) we worked very closely with Freeman-United throughout the negotiations to assure that the distribution costs associated with the movement would be competitive.

The key to being competitive in the international marketplace is to look at the costs of "delivered BTU", that is, the cost of the coal plus the total distribution costs associated with moving the coal from the mine to the ultimate user. If one were to compare rail and barge rates from Southern Illinois to the Port of New Orleans, the barge rates would appear less costly. However, if you look at total distribution costs—including the various handling and transfer charges associated with moving the coal from the mine to the river and barge demurrage or storage in New Orleans, the rail costs are significantly less. Thus, moving the coal by rail over the U.S. inland transportation segment of the export movement offsets the slightly higher ocean transportation costs from New Orleans to Spain. This advantage provided Freeman-United a competitive edge over eastern U.S. coal.

PREPARED STATEMENT OF HERBERT R. HAAR, JR.

The Board of Commissioners of the Port of New Orleans is a strong advocate for the deepening of the Southwest Pass and for a 55-foot channel all the way to Baton Rouge. The total waterborne commerce (foreign and domestic) on the Mississippi River below Baton Rouge was 572,181,000 tons in 1978. This is 28 percent of the Nation's total waterborne commerce. Louisiana deepwater ports handled over 20 percent of all the Nation's Foreign Commerce in 1979. The economic impact of their foreign commerce (excluding petroleum) represents 226,667 jobs, with a financial impact of $9.5 billion.

The growth of U.S. grain exports over the past 10 years is a phenomenal success story—a marvelous example of the free enterprise system at work.

During the last decade, world grain trade just about doubled—rising from 108 million tons to 213 million tons. During the same period, U.S. exports increased from 46 million tons to 127 million—a gain of more than 250 percent. The U.S. share of world trade has risen from 40 percent to almost 60 percent. This is an example of growth both in real terms and relative terms. During the same 10-year period, Canada's exports have remained unchanged.

The 10 modern export grain elevators between Baton Rouge and the Gulf handled 39 percent of all the Nation's grain export in 1980. Clearly, our economy has benefited in terms of foreign exchange earnings and the creation of jobs. In fiscal 1979, agricultural exports amounted to $32 billion, or 20 percent, of this country's exports. Agriculture had a favorable balance of trade of $16 billion whereas the country had a deficit balance of $28 billion in total—clearly demonstrating the importance of grain exports as the major dollar earner. Conservative projections by the grain exporters show that by 1990 this grain movement alone will represent 96 million tons annually.

Producing grain for the expanding world demand would not have resulted in the huge growth of exports had there not been commensurate growth in handling facilities and capability. Continental grain company alone is investing a quarter of a billion dollars in rebuilding its port of New Orleans Terminal. Huge private investments have been made in export terminals, interior loading stations, hopper cars, and barges. It is only natural that much of this capital has been invested in facilities from Baton Rouge to the Gulf on the Mississippi River. The river is the cheapest link between the main producing areas of this country and the major foreign markets. What is missing is the ability to get efficient bulk carriers, 150,000 dead weight vessels, to these modern export grain elevators.

The project to provide a 55-foot channel from Baton Rouge to the gulf has strong local support. The President of the United States and former President Carter have both spoken in favor of the project. The Louisiana congressional delegation is strongly in favor, and Senator Johnston has prepared legislation to expedite the required review and funding.

It is uncommon to find a waterway project with such a high benefit to cost ratio—8.5 to 1—based solely on the 1976 cargo movements. In the port's opinion, this benefit to cost ratio could be doubled if the port's projected coal exports are included.

The port is in a position to see, on a day-to-day basis, the trends in international trade and the world markets available for U.S. goods. The port's trade offices are located strategically throughout the United States and the world. From reports received within the past year, we are able to say unequivocally and without hesitation that the future is very bright provided the deepening can be accomplished on an expedited schedule. The port's projections for coal movements involve extremely rapid growth—from 1½ million tons in 1979 to 7 million tons in 1980, and an estimated 12 million tons in 1981, to 60 million tons before 1985, and double that figure by 1990. The basis for predicting a rapid growth in the use and export of coal is based on fundamentals of the energy crisis.

The cost of petroleum products continues to increase. In the past 2 years, the cost of petroleum has more than doubled. The revolution in Iran reduced the export of petroleum from that country.

This Nation and allied nations are deeply concerned with the availability of petroleum and are seeking alternate sources of energy. Hydropower is limited, and in the developed nations has been extensively exploited. Solar, wind, and geothermal is not expected to be of significance until after the year 2000, and even then will represent only a very small percentage of energy required. Nuclear power has broad and strong environmental opposition. Only coal has the immediate potential to alleviate this Nation's and allied nations' dependence on petroluem.

Wocol projects export potential of 350 million tons per year of coal from the United States by the year 2000. Dr. Ulf Lantzke, executive director, International Energy Agency, at the 63d annual meeting of the National Coal Association, projected 100 million tons of coal export by the United States in 1990, rising to 300 million tons by the year 2000. He also projected that Western Europe would be importing 500 million tons of coal per year by the end of the century. France alone is today importing over 35 million tons of coal per year and is seeking to purchase 10 to 15 million tons per year from the United States by 1985.

The Coal Exporters Association is predicting exports of 90 million tons of coal for 1980. This is only 11 percent of the U.S. total coal production of 815 million tons, and most of this export coal is metallurgical coal.

The big demand in the future will be for steam coal, very little of which is presently exported from the United States. Of the 90 million tons, Hampton Roads is expected to ship over 60 million tons in the future from its piers at Norfolk and at Newport News. An average of 50 ships are waiting to load coal at these ports, and in recent months the backup has been a high as 100 ships and over.

The tremendous interest in the Lower Mississippi River, between Baton Rouge and the gulf, is directly related to the ability of the Mississippi River to transport large volumes of coal. The barge lines recognize this, and two barge lines—the American Commercial Barge Line and the Federal Barge Line—have invested over $55 million in modern, efficient rail-to-water transfer facilities, capable of handling 30 million tons of coal per year. The barge lines can transport this coal coming from the States bordering on the Upper Mississippi River and its tributaries to the planned coal export terminals in tows of 600,000 tons each.

Additionally, coal slurry pipelines with a potential annual throughput of approximately 100,000,000 ton are being planned for terminals in Houston, Baton Rouge, and Florida. The one for Baton Rouge, with a 25,000,000 ton annual capacity should be the first to come on line.

At the International Marine Terminal, 50 miles below New Orleans, ample ground storage is available, and barges do not wait for ships and ships do not wait for barges. This terminal will be expanded to handle 12 million tons of coal by 1982. Across the river, electro-coal transfer company is expanding its capacity with a $100 million plus two-phase expansion program. This expansion will permit them to handle 25 million tons of export coal by 1983 near Baton Rouge, the River and Gulf Transportation Company has acquired almost 600 acres of land for an export terminal capable of handling 11 million tons of coal and 5 million tons of iron ore by 1985 and 15 million tons of coal by 1990. Five other coal terminals are in the planning stages and have either found sites or have been authorized to obtain options on land plus one recently rehabilitated terminal which is now going on line.

The French Government has a monopoly on coal production and purchasing. The Association Technique de L'Importation Charbonniere (ATIC) is the sole agency in France responsible for importing the large quantities of foreign coal necessary to provide replacement for oil. ATIC is also acting as agent for the Spanish and Netherland Governments and is coordinating its efforts with West Germany. The aim of ATIC is long-term contracts with coal suppliers in nations with stable governments. Their interest does not stop at the purchase of coal but extends to the transportation and shipment. To be assured of a smooth flow, ATIC will obtain a participating interest in barge companies and in coal export terminals.

On November 1, the president of the French National Manufacturers' Association, Mr. Francois Ceyrack, accompanied by the Assistant to the President of France, and the French minister for Commercial Affairs in the United States, visited the port to determine steps necessary to expedite export of coal to France and imports of manufactured products to the United States. Additionally, ATIC (Association Technique de L'Importation Charbonniere) has been in active discussion with the port of New Orleans since 1979 on the possibilities of constructing an export coal facility on the lower Mississippi River. ATIC's current plans envision a joint venture of such a terminal with American principals. I, personally, expect some specific announcement by the French in the very near future as to the details of their joint venture. An early decision on this matter has been enhanced by President Reagan's support of a special effort to support fast-track legislation in Congress for deepening the Mississippi River from 40 to 55 feet. Congressional leaders from several coastal states have introduced legislation to provide, on a fast-track basis, deeper access to the Nation's ports, with special emphasis on New Orleans, Norfolk, and Mobile.

A participating interest by the public and private sectors does not appear possible where the terminals are owned by the railroads and are served exclusively by rail. Terminals on the lower Mississippi River are capable of being served by both barge and rail. The Illinois Central Gulf Railroad is investing heavily in improvements of their trackage to New Orleans in anticipation of unit train movements of coal to and from the Illinois coal fields. At the board meeting of January 16, their vice president announced that with agreement with Ryan Walsh to operate the port's bulk terminal, the railroad was placing an additional order for 400 coal cars. This competition with the barge lines will preclude increases in transportation costs such as have occurred in western areas where only one mode of transportation was available.

No port on the Atlantic or gulf coast has adequate channel depth to accommodate today's large bulk carriers. This is in contrast to ports such as Antwerp, with a 61-foot draft; Kashima, Japan, with a 72-foot draft; the port of Fos, France, with a 55-foot draft at its coal terminal; and the port of Le Harve, France, with a 50-foot draft. Today, the workhorse of the bulk carrier trade is the 150,000 DWT vessel, requiring a 55-foot draft. In 1970, bulk carriers of only 100,000 DWT represented only 3 percent of the international bulk trade. By 1977, this had increased to 25 percent and is increasing every year. American exports of grain and coal are penalized because these vessels cannot be fully loaded. Transportation savings on a ton of cargo from New Orleans to Europe, moving in a vessel loaded to a 50-foot draft versus the restriction imposed by the presently authorized 40-foot channel, is estimated at between $6 and $7. This could easily represent a billion dollars additional income to the producers by 1990.

For these reasons, the deepwater Louisiana ports on the Lower Mississippi River, which serve a third of the Continental United States, must be provided with an adequate access to the high seas. The Port of New Orleans not only strongly supports this project, but also supports all efforts to expedite the review, approval, and funding of the project. Representatives of the 18 Mid-American States which make up the hinterland of this Lower Mississippi River will also reap large economical benefits from the accomplishment of this project. If this project is not accomplished or expedited, the U.S. may lose much of the new trade opportunities to foreign competitors in world markets.

In reference to a position on increased and/or new waterway user charges plus cost-sharing and cost-recovery proposals, we have very mixed feelings. On the one hand we are opposed to them in principle because we feel that they are inflationary in that they are passed on to the consumer and that they also raise the cost of American exports in world markets. Inasmuch as the administration and the Congress appear determined to move forward with some version of these charges this year, then we advise taking some insurance. We would recommend that fast-track deepening legislation incorporate not over 25 to 50 percent cost-recovery requirement with the final amount determined by the outcome of a 6-month study to be carried out jointly by the Assistant Secretary of Commerce for Maritime Affairs and the U.S. Trade Representative to determine the impact of these charges on the competitiveness of the U.S. in international trade and the impact on the traditional distribution of U.S. commerce between ports and competing transportation modes.

With regard to operation and maintenance charges, we would recommend the same 25 to 50 percent limitation pending the outcome of the previously recommended study. We would like to make a number of specific recommendations on provisions for inclusion in any fast-tract deepening legislation that the Congress may pass. These are contained in annex A hereto, and in the interest of time I will only briefly summarize from the annex the highlights.

We would also like to add, as annex B, a brief consultant's report covering the primary benefits to the petroleum industry from a 55-foot channel deepening of the Lower Mississippi River from Baton Rouge to the gulf. This report shows that there will be also substantial benefits for petroleum movements on the river once it is deepened.

Annex C contains a copy of an article from the April 1981 issue of "Coal Age" that shows that Illinois coal can be delivered to Europe via the gulf coast at an $8 to $11 per ton saving over movement via the east coasl.

Mr. Chairman, I appreciate very much having had this chance to present this statement for your consideration.

ANNEX A

RECOMMENDED FEATURES OF DEEP DRAFT LEGISLATION

A number of bills have been introduced (and reintroduced) recently in both the Senate and the House to authorize a "fast track" procedure for "deep draft" dredging projects, both for named ports and pursuant to criteria applicable to all ports. The Port of New Orleans feels that any deep draft legislation finally enacted should contain the following features:

I. FAST TRACK PROCEDURE

A. To avoid the delays inherent in the normal course of the environmental permit process, the legislation should provide for submission to Congress of an EIS addressing the purposes, policies and requirements of the various environmental laws, with the further provision that absent Congressional disapproval by concurrent resolution within 60 days the requirements of these environmental laws will be considered as satisfied.

B. With respect to ports not named in the authorizing legislation itself, provision should be made for Congressional approval of the navigation improvement (as satisfying the generic criteria required for use of the fast track procedure) either (1) as part of Congressional approval of the EIS for the project, or (2) by provision for a threshold submission to Congress, with further provision that absent Congressional disapproval by concurrent resolution within 60 days, the navigation improvement will be considered as authorized.

C. The legislation should follow the provisions for judicial review in "the Trans-Alaska Pipeline Act," 43 USCA § 1652(g), in (1) restricting judicial review to allow only the assertion of claims alleging the invalidity of the Act, the denial of Constitutional rights under the Act, or action in excess of authority under the Act; in (2) requiring the filing of such claims within 60 days of the action in question; in (3) precluding the issuance of injunctive relief except in connection with a final judgment; and in (4) allowing direct appeal to the Supreme Court.

D. The legislation should not allow the assertion of claims alleging the inadequacy of the final EIS after the EIS is considered approved by Congress. Such a legislative finding and determination should not be subject to judicial review by claimants who disagree with the legislative wisdom of the decision. Congress' judgment should remain final, except as limited by the Constitution.

E. The provisions for judicial review should be the sole and exclusive means for review of navigation improvements under the Act.

II. PROVISIONS FOR COST RECOVERY

A. Recovery of Federal costs for construction and O & M should be limited to those costs attributable to the channel deepening authorized by the legislation, and should not include costs associated with previously authorized channel depth and maintenance. To provide otherwise would go beyond requiring local assuring agencies to bear their share of the navigation improvement in question and would have the effort of imposing additional costs upon ports for previously authorized and undertaken improvements.

B. Recovery of Federal costs should be limited to 25–50 percent for construction and O & M.

C. Recovery of Federal costs from a local assuring body should be limited to "net Federal costs," which should be defined as construction costs and O & M costs less benefits accruing to areas, interests, or persons beyond the local assuring body (e.g., regional and national benefits).

D. The cost-reimbursement obligation of non-Federal interests should be accompanied by a corresponding right to recoup reimbursement costs by the imposition of user changes and fees, and the reimbursement obligation should be binding upon the local assuring body (and payable) only to the extent of user fees and charges collected.

E. Assurances of local cooperation required for the navigation improvement should be such assurances as are "satisfactory to the Secretary of the Army."

F. Navigation improvements required as a result of extraordinary and unforeseen forces (e.g., force majeure or vis major) should be excluded from any cost reimbursement obligations.

ANNEX B

PRIMARY BENEFITS OF A 55-FOOT CHANNEL FOR THE MISSISSIPPI RIVER, MOUTH OF PASSES TO PORT OF BATON ROUGE

Prepared for: Board of Commissioners of the Port of New Orleans

Prepared by: G. C. R. & Associates, Inc., May 5, 1981

TABLE OF CONTENTS

Executive summary.

Primary benefits of a 55-foot channel for the Mississippi River, Mouth of Passes to Port of Baton Rouge.

Summary statement.

Exhibit 1—1978 petrochemical movements on the Mississippi River from Mouth of Passes to the Port of Baton Rouge, by commodity and short ton.

Exhibit 2—Tanker movements with 30–40 foot drafts between Mouth of Passes and the Port of Baton Rouge, 1978.

Exhibit 3—Lightering.

Exhibit 4—Country of origin of imported crude received on the Mississippi River from the Mouth of Passes to the Port of Baton Rouge.

Exhibit 5—Potential transportation costs of importing crude petroleum and No. 6 fuel oil in 150k dwt and 80k dwt tankers.

- Table 5-A—Potential transportation costs of importing crude petroleum and No. 6 fuel oil in 150k dwt tankers and 80k dwt tankers.
- Table 5-B—Imports of refined petroleum products to the Mississippi River, Mouth of Passes through the Port of Baton Rouge.

Exhibit 6—Potential transportation costs of importing crude petroleum and No. 6 fuel oil by 150k dwt and lightering to allow navigation of the Mississippi River.

Exhibit 7—Summary of preliminary national energy plan III base projections

Persons contacted.

EXECUTIVE SUMMARY

PRIMARY BENEFITS OF A 55-FOOT CHANNEL FOR THE MISSISSIPPI RIVER MOUTH OF PASSES TO PORT OF BATON ROUGE

The deepening of the channel of the lower Mississippi River between the Mouth of Passes and the Port of Baton Rouge will prove to be of significant benefit to the petroleum and petrochemical industries in southeastern Louisiana. Larger ships carrying greater payloads will be able to navigate the river. This will actually decrease the number of ships on the lower Mississippi, and therefore it will improve the operational and safety characteristics of the remaining traffic. The larger ships will transport cargo more cost effectively. In fact, their use will result in significant savings to local consumers of commodities which are transported by ship. The petrochemical and petroleum industries could have realized a savings of up to $228,300,000 in 1980 if imported crude and petroleum products had been shipped to their ports of destination in 150K DWT tankers rather than in smaller ships and barges. This figure, which is substantiated in the body of this report, represents savings of approximately forty-three percent of the total transportation costs of crude from selected ports of origin. Given the critical need for petroleum and petrochemical products in the United States, the deepening of the navigable channel of the lower Mississippi to fifty-five feet will prove to be of national significance and will serve to maintain the ports of New Orleans and Baton Rouge as major world ports.

1. Deep draft vessels (Very Large Cargo Carriers—VLCC) will be able to navigate the lower Mississippi River. The salient benefits of this will be:

A. A reduction in river traffic through the use of larger ships with greater payloads. This reduction will facilitate the operating characteristics of traffic on the river and actually provide additional space for a net growth in cargo transported.

B. Larger vessels, specifically tankers, operate in a more cost-effective manner than smaller ships. A review of current World Scale rates demonstrates that ships in the 150K DWT range offer a transportation savings of up to 43 percent over those in the 80K DWT range. Given the amount of crude that will be transported into this area, the savings realized through the use of VLCC will be substantial. The approximate savings that would have resulted if all crude and No. 6 fuel oil imported in 1980 was shipped in 150K DWT tankers rather than in 80K DWT tankers is $228,301,600.

C. The need to lighter crude will be substantially reduced, if not eliminated. The cost of transferring oil from ship to barge has grown to approximately $1.00 a barrel of crude lightered, and lightering has often resulted in unanticipated delays and demurrage charges on the affected tankers.

2. The elimination of the constraint of the forty-foot channel may encourage more crude to flow into the area; that is, local refiners will be able to search more widely in world markets for crude because of improved access to their ports of destination. Transportation costs will be reduced, and thus distant markets will prove to be more competitive. This benefit will be realized throughout the American economy because products are sold in domestic markets. The lowered cost of production will be reflected in the price of refined products.

3. The fifty-five foot channel will prove to be a cost effective alternative to the Louisiana Offshore Oil Pipeline for those users (refiners) who are not members of LOOP. The presence of an economical alternative mode of transportation will allow independent refiners to maintain a competitive posture with the major oil companies in LOOP. The presence of competition in the market will assist in stabilizing the cost of products to the American consumer and industrial users.

SUMMARY STATEMENT

TRANSPORTATION OF PETROLEUM AND RELATED PRODUCTS ON THE LOWER MISSISSIPPI RIVER

1. Petrochemical movements with points of origin or destination on the lower Mississippi River between the Mouth of Passes and the Port of Baton Rouge totaled 170,609,541 short tons in 1978. The transportation of crude petroleum accounted for 106,355,853 short tons or 62.3 percent of this tonnage (Exhibit 1).

2. Of the total tanker traffic recorded on the lower section of the Mississippi River in 1978 (3850 ship movements), approximately 45 percent (1728) consisted of vessels with a draft of thirty feet or more. Approximately 1047 shipments (27.2 percent) were made in tankers with a draft of 35 feet or greater, and 260 of those were in tankers with a draft of 40 feet—the maximum draft capable of navigating the existing channel (Exhibit 2).

3. The transportation of crude or products in large vessels is more cost effective than comparable movements in smaller vessels. The current World Scale rates (April 27, 1981) from selected origins to a destination between the ports of New Orleans and Baton Rouge are illustrative of this point. Assuming the chartering of a tanker for an average grade of crude, the following scales are applicable.

WORLD SCALE

	Origin				
	Persian Gulf	West Coast Africa	North West Europe	Mediterranean	Venezuela
Tanker size (deadweight tons):					
80,000	80.0	80.0	70.0	75.0	85.0
150,000	47.5	47.5	40.0	42.5	52.5
Percent difference	40.6	40.6	42.9	43.3	32.4

However, it should be noted that when the larger tankers (greater than 80K DWT) are used to transport crude into the area, they must be lightered to meet the navigation constraints of the Mississippi River. The lightering process is accomplished by off-loading cargo to either barges or smaller ships (Exhibit 3) and is both a time-consuming and expensive operation which costs up to $1.00 per barrel of crude transferred.

In 1980, 1294 vessels carrying a combined total of 490,977,641 barrels of crude oil entered the Mississippi River to deliver to facilities between the Mouth of

Passes and the Port of Baton Rouge (See Exhibit 5 for countries of origin of imported crude). Fifty percent of these ships received their oil from larger tankers in the Gulf. Of those vessels that entered the Mississippi River, 3 percent were forced to lighter into barges to reach their port of destination. It should be noted however, that the number of vessels required to off-load into barges in 1981 is expected to be significantly greater. One contractor alone has reported the lightering of 13 vessels (approximately 1,300,000 barrels of crude) in the period from January 1, to March 31, 1981. In 1980 an additional 2 percent of the ships coming into the river lightered into some type of smaller vessel other than barges.

The average payload of the tankers carrying crude into the Mississippi River in 1980 was approximately 379,500 barrels (490,977,641 barrels imported in 1294 vessels). If the fifty percent of these shipments that were lightered from tankers in the Gulf could have been transported to the refineries in larger ships, the traffic on the river may have been reduced by 424 vessels. That is, 647 received oil offshore from larger ships; if that volume of crude, 245,536,500 barrels (647×379,500), could have been transported in vessels with a capacity of 1,100,000 barrels (average 150K DWT capacity), this movement would have been made in only 223 tankers.

The cost of shipping oil in small tankers relative to importing it in larger tankers has been researched. If the crude petroleum and No. 6 fuel oil imported in 1980 were shipped in 80K DWT tankers from its ports of origin to its destinations on the lower Mississippi River, the cost of transportation would have been approximately $536,300,000 and $14,600,000, respectively. On the other hand, if these commodities had been shipped in 150K DWT tankers, the estimated total cost of transportation would have been $322,600,000. This represents a savings of approximately $228,300,000. The details of these calculations are presented in Exhibit 6.

The cost of transporting these commodities via 150K DWT tankers and lightering at the Mouth of Passes was also researched. A cost computation was made to reflect the long haul transportation costs of a large tanker (VLCC) and the required lightering cost to allow the VLCC to navigate the river channel to its point of destination. The final cost estimate of $555,251,100, which is supported in Exhibit 6, approximates that computed for the transportation of crude and fuel oil in 80K DWT tankers from point of origin to point of destination.

The scenarios described above are presented as illustrations of the potential of deep draft vessels. They are based upon average payloads and a number of other constructed assumptions and are not intended to be definitive statements about crude movements on the lower Mississippi River.

4. Refineries in the project area anticipate a continuing demand for crude oil, and this expectation is supported by the projections presented in documents prepared for the formation of the Third National Energy Plan. It is projected that imports will continue either at or near present levels through the year 1990. Present levels are 7.9 million barrels per day, of which approximately 1.975 barrels (25 percent) enter the U.S. through the Mississippi River (Exhibit 7).

EXHIBIT 1

1978 PETROCHEMICAL MOVEMENTS ON THE MISSISSIPPI RIVER FROM MOUTH OF PASSES TO THE PORT OF BATON ROUGE BY COMMODITY AND SHORT TON

Commodity	Total	Foreign		Domestic						
				Coastwise						
						Through		Internal [1]		
		Imports	Exports	Receipts	Shipments	Upbound	Downbound	Receipts	Shipments	Local
Crude petroleum	106, 355, 853	78, 378, 705	1, 093	5, 789, 674	338, 824	5, 781, 014	91, 212	6, 206, 358	8, 406, 554	1, 362, 419
Basic chemicals	8, 401, 042	187, 886	1, 831, 526	27, 630	196, 689	11, 713	184, 722	1, 015, 372	3, 635, 908	1, 309, 596
Gasoline	15, 624, 887		23, 533	203, 655	4, 167, 304	181, 016	3, 677, 697	1, 580, 063	5, 364, 922	431, 697
Distillate fuel oil	10, 279, 335		132	253, 987	2, 241, 415	175, 163	2, 067, 940	934, 836	3, 559, 556	1, 046, 306
Residual fuel oil	24, 039, 569	34, 906		950, 923	3, 070, 116	587, 437	2, 840, 170	5, 723, 988	6, 853, 199	3, 978, 830
Lubricating oil	3, 074, 192	75, 510	633, 839	41, 697	258, 184	22, 813	248, 402	297, 881	1, 472, 588	23, 278
Coke, petroleum coke	2, 829, 663	1, 634, 609	256, 962					535, 765	323, 147	79, 180
Total	170, 609, 541	80, 311, 616	2, 747, 085	7, 267, 566	10, 272, 532	6, 759, 156	9, 110, 143	16, 294, 263	29, 615, 874	8, 231, 306

[1] Internal traffic data was not available for movements completely within the stretch between mile 127 (Norco, La.) and mile 168 (Burnside, La.).

Source: Department of the Army, Corps of Engineers. "Waterborne Commerce of the United States: Calendar Year 1978, Part 2: Waterways and Harbors—Gulf Coast Mississippi River System and Antilles."

EXHIBIT 2

TANKER MOVEMENTS WITH 30-TO 40-FT DRAFTS BETWEEN MOUTH OF PASSES AND THE PORT OF BATON ROUGE 1978

Drafts	Inbound	Percent of total	Outbound	Percent of total	Total	Percent of total
30 to 40 ft	859	44.6	869	45.2	1,728	44.9
35 to 40 ft	608	31.5	439	22.8	1,047	27.2
40 ft	178	9.2	82	4.2	260	6.8
Total trips	1,927	100.0	1,923	100.0	3,850	100.0

Source: Department of the Army, Corps of Engineers. "Waterborne Commerce of the United States: Calendar Year 1978, Part 2: Waterways and Harbors—Gulf Coast, Mississippi River System and Antilles."

EXHIBIT 3

LIGHTERING

Lightering is the process used to raise the draft of a vessel in which part of the cargo is off-loaded onto another vessel. This procedure is undertaken on a regular basis by crude oil tankers entering the Mississippi River. Two methods of lightering are employed by the oil industry in the study area. The first method involves off-loading a portion of the cargo onto a contract barge or smaller vessel and then transporting the cargos in both vessels to the refinery. In the other method, a larger vessel unloads its cargo offshore onto smaller vessels which can navigate the river's restricted channel.

Of the two processes, it is difficult to determine which is more costly. The use of multiple vessels, however, can assuredly be categorized as an anticipated expense. In contrast, the use of the barge method is often unplanned, and thus its cost is unexpected. The latter method must be utilized primarily when a vessel's draft exceeds that of the channel on a given day, although it is also used on a planned basis. The former method is employed to lessen the cost of long distance transportation by use of very large ships. Smaller vessels then shuttle cargo to refineries from the Gulf. The cost of both types of lightering operations contributes directly to the price of refining oil, and places rather strict restraints on the operations of refining facilities. A deeper channel would affect these lightering procedures by allowing larger, more cost-effective vessels to enter the river without the necessity of planned lightering.

COSTS OF LIGHTERING

The estimated cost of lightering onto barges, a contract service available through independent contractors in the area, approaches and sometimes exceeds $1.00 per barrel offloaded. Average lightering jobs transfer between 100,000 to 200,000 barrels. Generally this cost is reflected as an additional $.20–$.35 per barrel on the original shipment. Based on an average shipment of 600,000 barrels this cost would be significant. Demurrage charges, ranging from 20,000–35,000 per day, must often also be paid for delaying the normal operation of the vessel's contract in order to off-load cargo.

Estimations of ship-to-ship lightering costs cannot be readily ascertained. Prices vary according to contract and charter agreements. It is not unreasonable, however, to envision the costs as easily approaching those of the barge-lightering operations.

EXHIBIT 4

Country of origin of imported crude petroleum received on the Mississippi River from the Mouth of Passes to the Port of Baton Rouge

Country:	*Barrels*
Saudi Arabia	19,148,128
Bahamas	9,819,553
Algeria	54,498,518
Angola	14,729,329
Libya	71,191,758
Mexico	50,570,697
Nigeria	155,639,912
Norway	13,747,374
Trinidad	28,967,681
United Kingdom (North Sea)	49,588,742
Venezuela	23,075,949
Total	490,977,641

Source: U.S. Customs Service, New Orleans, Louisiana.

EXHIBIT 5

POTENTIAL TRANSPORTATION COSTS OF IMPORTING CRUDE PETROLEUM AND NO. 6 FUEL OIL IN 150K DWT 80K DWT TANKERS

In order to compare the costs of shipping crude petroleum and selected products by 150K DWT and 80K DWT tankers from the origins of the shipments to their destination on the lower Mississippi River these transportation costs were estimated using the current World Scale Freight and World Scale Vessel Chartering Rates in the following manner:

1. Current rates were obtained for the applicable movements. The World Scale Freight Rates are set bi-annually and represent base costs per ton to ship a particular commodity between two specified ports. Vessel chartering rates fluctuate according to the demand for and supply of each type of vessel within an area. Using the World Scale Freight Rate as the base unit, a Vessel Chartering Rate represents the fraction of this unit which must be paid to transport a commodity in a vessel of specified dimensions. The applicable World Scale Rates for shipping an average grade of crude oil from a representative port in each of the seven regions which export crude to the study area are displayed in Table 5-A of this exhibit. Each of the countries listed in Exhibit 4 as an exporter of crude to the lower Mississippi River, with the exception of the Bahamas, is included within one of these seven regions. No petroleum is produced in the Bahamas, but crude is stored there for transhipment. Thus, for the purposes of our calculations, crude imported from the Bahamas was considered to have originated in one of the exporting regions on the eastern side of the Atlantic Ocean in approximately the same proportions as crude that is shipped directly from those regions.
2. The number of barrels of crude imported from each of the areas of production was converted to long-tons using a ratio of 8.4 barrels of crude to 1 long-ton.
3. The tonnages coming from each region were multiplied by the World Scale Freight Rate to get the base cost of shipment.
4. In order to obtain the cost of transporting the shipments in 150K DWT tankers and 80K DWT tankers, the resulting values were multiplied by current World Scale Vessel Chartering Rates.
5. The difference between the calculated cost of shipment of crude oil in the two classes of tankers was listed in Table 5-A for imports from each region.
6. Import figures of refined petroleum products were studied to determine whether transporting those commodities in larger tankers might reduce transportation costs. As can be seen from Table 5-B, the only product which was imported in sufficient quantities in 1980 to realize a substantial savings from increasing the volumes of transporting vessels was No. 6 fuel oil.
7. The costs of shipping this No. 6 fuel oil, which is imported primarily from Algeria, were calculated for 150K DWT and 80K DWT vessels in the same manner as they had been for crude petroleum. For these calculations, it was assumed that the World Scale Rates for transporting fuel oil from the Mediterranean are not substantially different from those for shipping petroleum. No. 6 fuel oil is heavier than crude petroleum, however, and thus a different factor was used to convert the number of barrels imported to long-tons.
8. The total costs of transporting crude and No. 6 fuel oil in each of the two classes of tankers were found and are listed in Table 5-A along with the difference between the two total cost figures.

TABLE 5-A.—POTENTIAL TRANSPORTATION COSTS OF IMPORTING CRUDE PETROLEUM AND NO. 6 FUEL OIL IN 150K AND 80K DWT TANKERS

Origin	World scale freight rate	World scale vessel chartering rates		Quantity		Cost of[2] shipment	Cost of shipment[3] by vessel		Cost difference between methods of shipment
		150K dwt tanker	80K dwt tanker	Barrels	Long tons		150K dwt tanker	80K dwt tanker	
Crude petroleum:[1]									
Persian Gulf	$21.58	0.475	0.80	19,648,900	2,339,200	$50,470,000	$23,977,500	$40,383,200	$16,405,700
West Coast Africa:									
Nigeria	14.37	.475	.80	159,675,700	19,009,000	273,159,600	129,750,800	218,527,700	88,776,900
Angola	15.26	.475	.80	15,112,300	1,799,100	27,454,000	13,040,700	21,963,200	8,922,500
North West Europe	11.36	.40	.70	64,976,000	7,735,200	87,872,300	35,148,900	61,510,600	26,361,700
Mediterranean	13.87	.425	.75	128,950,400	15,351,200	212,921,600	90,491,700	159,691,200	69,199,500
Venezuela	4.74	.525	.85	52,043,600	6,195,700	29,365,500	15,417,900	24,962,400	9,544,500
Mexico	2.56	.42	.60	50,570,700	6,020,300	15,412,000	6,473,100	9,247,200	2,774,100
Total, crude petroleum				490,977,600	58,449,700		314,300,600	536,285,500	221,984,900
No. 6 fuel oil: Mediterranean	13.87	.425	.75	10,509,800	1,401,300	19,436,100	8,260,300	14,577,100	6,316,700
Total				501,487,400	59,851,000		322,560,900	550,862,600	228,301,600

[1] Represents quantities imported in 1980.

[2] At prevailing world scale freight rates.

[3] At prevailing world scale freight rates multiplied by the world scale vessel chartering rates

TABLE 5-B.—IMPORTS OF REFINED PETROLEUM PRODUCTS TO THE MISSISSIPPI RIVER, MOUTH OF PASSES THROUGH THE PORT OF BATON ROUGE

Cargo	Quantity		Primary country of origin
	Barrels	Pounds	
Creosote	678,129		Trinidad.
Catfeed	1,958,000		Nigeria, Libya.
Xylene	112,892		Trinidad.
Toulene	897,411		Libya.
Premium gas	47,266		United Kingdom.
No. 6 fuel oil	10,509,798		Algeria.
Naphtha		108,497,011	Argentina.
Benzene		12,100,089	Israel.
Butidiene		41,821,749	Nigeria.

Source: U.S. Customs Service, New Orleans, La.

POTENTIAL TRANSPORTATION COSTS OF IMPORTING CRUDE PETROLEUM AND NO. 6 FUEL OIL BY 150 DWT TANKERS AND LIGHTERING TO ALLOW NAVIGATION OF THE MISSISSIPPI RIVER

As a second point of comparison, the transportation cost was computed for crude shipped from the port of origin in 150K DWT tankers which were lightered to the point that the ship could navigate the existing channel at the mouth of the river. Given the assumption that a fully loaded 80K DWT tanker can navigate the lower Mississippi, it was assumed that a 150K DWT vessel carrying an equivalent amount of crude would also be capable of passing through the channel. Thus the difference in the amount of payload between the two vessels was assumed to be the volume lightered. Under the assumptions of this scenario, approximately 46.4 percent of the crude transported in the 150K DWT tankers would be lightered at the current estimated cost of $1.00 per barrel. This figure for the volume of crude lightered is comparable to the amount reported by the U.S. Customs in 1980. Continuing the calculations using this volume figure results in a relative cost estimate that is consistent with current experience in ship chartering.

It is very interesting to note that the total costs of transporting crude in this scenario is $555,251,100, an amount that is remarkably close to the calculated cost of shipping the crude in 80K DWT tankers. Given the elasticity of demand in ship chartering, it is reasonable to assume that the cost of transporting crude by these two methods would be similar. If these costs were not similar, the cost differential would result in the exclusive or predominate use of one mode.

The transportation cost for this scenario was computed as follows:

1. It was assumed that 490,977,600 barrels of crude and 10,509,800 barrels of No. 6 fuel oil would be transported in 150K DWT ton tankers at current rates from those ports of origin recorded in 1980. As was demonstrated in Exhibit 5, the total cost of this movement was found to be $322,560,900.
2. It was estimated that 46.4 percent (232,690,200 barrels) of the crude and No. 6 fuel oil would be lightered at $1.00 per barrel.
3. The cost of lightering and the cost of shipment in 150K DWT tankers were summed, and the result was established as the total cost of transporting the crude of fuel oil from its points of origin to its destinations on the Mississippi River.

EXHIBIT 7

Preliminary National Energy Plan—III base case projections, prepared in November 1980, assume existing legislation and continuation of the previous Administration's energy policies as of that date. In these base case estimates, U.S. oil imports are likely to range from 7 to 9 million barrels per day in 1985, and 4 to 8 million barrels per day in 1990. Currently about 7.9 million barrels per day are imported.

Source: Department of Energy, Staff working paper for the Public Discussion package for the Third National Energy Plan. FR 46:18000, March 20, 1981.

PERSONS CONTACTED TO OBTAIN INFORMATION ON THE TRANSPORTATION OF PETROLEUM AND RELATED PRODUCTS ON THE LOWER MISSISSIPPI RIVER

Col. Herbert R. Haar, Jr., Associate Port Director, Board of Commissioners of the Port of New Orleans.

Linda Watson, Board of Commissioners of the Port of New Orleans.
S. F. Perrin, Jr., Executive Director, Louisiana Offshore Terminal Authority.
James Webb, Louisiana Offshore Terminal Authority.
Ronald Lambert, Good Hope Energy Corporation.
Kyle Rush, Good Hope Energy Corporation.
Roger Murray, Dock Superintendent, Shell Norco.
Barbara Heater, Murphy Oil.
Don Magio, Dowar Contractors.
John Cassio, III, Tanker Division.
Keith Knight, Gauger, U.S. Customs, St. Andrews Wharf.
Max Willes, District Director, U.S. Customs Service.
Chris Kennely, Transportation Manager, Tenneco.
Wayne Babin, Tenneco.
Bob Galloway, U.S. Customs Service.

ANNEX C

[From Coal Age, April 1981]

EXPORT MARKET KEY TO ILLINOIS CENTRAL GULF COAL PLANS

Pinpointing the export market for high-sulfur Illinois Basin coal as its largest growth commodity, the Illinois Central Gulf Railroad (ICG) has launched a major effort to capture the all-rail movement of that coal to the Gulf. If successful, the move could knock the railroad's traditional barge competition out of the water.

"The Illinois Basin has 215 billion tons of recoverable steam coal," says Harry Bruce, senior vice president of ICG marketing. "The ICG rail system has access to 115 billion of those tons, and we plan to grab a substantial share of the market." In its initial operating phase, the company expects to move 500,000 tons in 1981, 1 million tons in 1982 and 1.5 million tons in 1983.

To gain an edge on the short haul rail-to-barge market, the ICG has spent the past year researching and developing the U.S. coal export market, although the company owns no mines and does not plan to buy or sell coal. The ICG sees itself as the catalyst-strategist to bring European buyers to the Illinois Basin, and has taken on the role of marketing expert for Midwest coal producers.

A NEED FOR COST COMPARISONS

Its first job has been to refute the myths both here and abroad regarding the economics of rail movement and the quality of Illinois Basin coal, according to Bruce. U.S. coal producers argue that barge movement is the cheapest way to move coal. "The conventional belief in the cost efficiencies of barge transport would seem to dictate that the ICG leave export coal to the river and concentrate on domestic coal and other commodities," says Bruce. He claims, however, that barge rates have many hidden costs, such as shorthaul rail-to-river, coal handling and loss, and transfer charges at the port. Total cost of rail-barge shipment to the Gulf from Illinois is $14.50 per ton compared with between $11 and $16.25 per ton moving all-rail, according to Bruce. He also notes that, with the tariff the ICG secured last September, the railroad can change coal movement rates within the range of $11 and $16.25 per ton on two-day notice, as opposed to the previous 30-day notice requirement. "This allows us to float our charges, using the going barge rate as the barometer," says Bruce.

In addition, because of a barge shortage, Bruce contends that coal producers must often wait several days for barges, whereas the ICG can make the 600-mile run from Illinois to the Gulf in two days. "Conventional wisdom has always been that a railroad is just a link-belt between the mine and the river," Bruce says. "We're saying that our location and speed are right, and we've done our homework and gotten a tariff in place. That makes all-rail a solid competitor for coal traffic." ICG optimism is illustrated by its plans to build more than 400 100-ton coal cars in 1981 to handle the shipments.

However, European coal purchasers must also be convinced that shipping not more so, than shipping from East Coast ports. According to Robert J. Neubauer, assistant vice president of ICG's coal operations, 77 percent of all export coal now moves out of eastern ports. However, he argues that port congestion in the East often causes four-to-eight week waits to load the coal, adding demurrage charges of $7 to $10 to the cost of each ton.

In comparison, the Gulf ports have had only minor backup problems. To increase export capacity from the Gulf, the public bulk terminal in New Orleans is being rehabilitated by the Port of New Orleans and will have a coal export capacity of 5 million tons addition, the Port of New Orleans plans to construct and open a new facility between New Orleans and Baton Rouge by 1987 with a 25-million-ton capacity.

A EUROPEAN EDUCATION

But before selecting a departure point, European coal purchasers must be persuaded to use Illinois Basin coal, rather than the traditionally-bought Appalachian coal. "There is a lack of knowledge about what is available in the Illinois Basin," Neubauer contends. "It's our role to educate the Europeans." That education includes proving to foreign industry that the Basin coal meets its specifications. Much of the coal, with a sulfur content of 1.5 percent to 4 percent, does not meet U.S. Environmental Protection Agency (EPA) standards. But according to ICG marketing analyses, Spain, the seventh largest producer of cement in the world, has a 2 percent to 2.5 percent sulfur content limit on coal used in those plants, higher than U.S. restrictions. Although its utility industry has a sulfur content restriction between 1 percent and 1.5 percent, overall use of the Basin coal would still be higher in Spain than currently allowable in the U.S. The ICG estimates Spain's current purchase potential at 15 million tpy.

In addition, company reports show that Denmark, which imported 2.8 million tons of U.S. coal in 1980, plans to purchase 20 million tons by 1990. The ICG is now studying markets in Italy and Greece.

According to Neubauer, there is sufficient excess capacity in Illinois Basin mines to get the export business under way now. "All the producers have to do is increase production capacity," he says. The ICG has approached Old Ben Coal Co., a subsidiary of SOHIO Petroleum Co., and Freeman United Coal Mining Co., which both have mines in the Basin. In addition, Kerr-McGee Corp. has plans to open a mine in the mid-1980s near Galatia, Ill., accessible to ICG track. That mine contains 122 million tons of saleable coal with a sulfur content of 1 percent to 2.7 percent. The company also has reserves nearby containing about 150 million tons. An official at Kerr-McGee says that the company is looking seriously at export markets and is considering all-rail transportation.

	Via gulf coast	Via east coast
Landed Btu cost (dollars):		
Coal price	25.00–30.00	28.00–33.00
Rail rate	12.00	13.00
Rail to vessel	2.50	.40
Ocean rate	12.00–14.00	11.00–13.00
Demurrage		7.00–10.00
Unloading	2.00	2.00
Total landed cost per net ton	53.50–60.50	61.40–71.40
Landed cost per million Btu	2.33– 2.63	2.56– 2.98

Source: Illinois Central Gulf RR.

OLD BEN GOES ALL RAIL

Harley Williams, vice president of marketing for Old Ben, says that his company exported 300,000 tons of Illinois Basin coal to Europe and Japan in 1980, its first venture into foreign markets. That coal moved rail-barge, but he anticipates that future movements may be all-rail. In recent years, the Mississippi River has been extremely low, backing up barge traffic. When the river rises, the Gulf ports become overloaded with barges, and demurrage charges skyrocket. "Rail unit trains avoid those kinds of problems," Williams says. "If competitively priced, we would definitely consider moving all-rail." He notes that the Gulf ports are also relatively congestion-free compared to eastern ports. The major problem is marketing Illinois Basin coal overseas, Williams claims, with Basin coal "marginally competitive" with the current low price of Appalachian coal. "The economics favor eastern coal, notwithstanding the port situation," he says.

But other midwestern railroads are taking the ICG's lead and looking at all rail coal shipments to the Gulf, in anticipation of a market surge. According to Norman Clucas, assistant manager of coal sales and service for St. Louis-based Missouri Pacific Railroad Co., the railroad presently moves coal short haul to barges only, but plans are under way to start minemouth-to-shipberth coal transportation. "Everything is ready to bust loose," he says. "As soon as someone in Europe signs a contract with a U.S. producer, docks will be built and expanded, and all-rail will be the fastest way to go."

The ICG is not waiting until the market opens up. Bruce refers to the statistics from the Massachusetts Institute of Technology 1980 World Coal Study, which states that world demand for steam coal could reach 333 million to 756 million tons annually by the year 2000, and U.S. market share could hit between 116 and 265 million tons. With Illinois Basin capacity in excess of 215 million tons, Bruce concludes, "For the ICG, export coal will be the biggest growth commodity. That's where we're putting our money, and right now we're one step ahead of everyone else."

Responses to Written Questions Submitted by Senator Percy to Colonel Haar

Question 1. Colonel Haar, I understand that the Port of New Orleans is now the busiest port in the country, with 167 million tons of cargo passing through it yearly. The second busiest port, the Port of New York, carries 163 million tons. The advent of coal exports from the Illinois Basin, which really hasn't begun yet, may place considerable strain on your port in the near future. Do you feel that the Port of New Orleans will be able to handle ample amounts of high-sulfur coal in the short term, even though it is not yet expanded to an optimum size?

Answer. Although the 167 million tons of cargo passing through New Orleans in 1979 seems large, the commerce between Baton Rouge and the Gulf was over 572 million tons that same year. A recent study performed by the Port of New Orleans by E. J. Bentz & Associates, Inc., indicated that 100 million tons of coal could efficiently be handled in 1990 by the coal terminals presently under construction or planned. This additional tonnage would represent only 15 percent of the total commerce on the Mississippi River below Baton Rouge. This small increase would hardly be noticed in the 230 miles of deep-water channel. The study by E. J. Bentz & Associates, Inc., titled "Economic Study of the Impact of a 55 Foot Channel on Various Cargo Movements through the Port of New Orleans," is offered for inclusion in the record.

Question 2. The logjams which plagued the Eastern ports last year, Colonel Haar, are often cited as the most severe problem that must be faced before American coal exports become a reality. It is true, however, that coal exports from the Gulf ports would face the same obstacles during high demand periods for coal exports?

Answer. No, it is not true that the coal exports from the Gulf ports will face the same obstacles as the Eastern ports during high coal export periods. The two existing coal terminals and the eight planned terminals on the deep-water portion of the Mississippi River are echeloned over a distance of 168 miles from the one nearest Baton Rouge at Mile 273 Ahead of Passes (AHP) to the one closest to the Gulf at Mile 55 AHP. This beneficial dispersion of the terminals will provide ample space for barge fleeting and vessel mooring. Also the construction of terminals along the river in sparcely populated areas provides space for ample ground storage of coal and enhances the ability of the terminals to rapidly unload barges and to load vessels.

Question 3. I understand that a great deal of private investment has begun to take place, to expand storage and handling facilities at the Port of New Orleans. Can you describe for us exactly what private and local groups are doing to prepare for the likelihood of increased foreign coal demand from the port?

Answer. First, of course, is the action of the authorities authorizing the issuance of Port Industrial Development Bonds. Next is the approval of required permits by the local authorities. The railroads serving the terminals have rehabilitated their trackage and placed orders for unit train coal cars. The river barge lines have, likewise, programmed increases in their fleets and new ship repair facilities have been announced. The entire establishment is proceeding as rapidly as possible to provide required infrastructure to handle this new export for the Nation.

Question 4. I understand that plans to begin expanding the port have not moved as quickly as we would like. Environmental Impact Statements are being prepared, but the completion of this could take years. What is the currnet status of the port expansion plans for New Orleans? What can be done to speed the process?

Answer. The Port facilities and coal terminals are being built as quickly as funds are made available but the required deeper access to the deep-water ports on the Mississippi River has progressed very slowly. Resolutions of the Senate Committee on Public Works in 1969 and 1971 request the U.S. Army Corps of Engineers to consider deepening the authorized 40-foot channel. Twelve years later, the recommendation for a 55-foot channel and the Draft of the Environmental Impact is only now being forwarded to Washington. Although the report shows that the project has benefit-to-cost-ratio of better than 10 to 1, even without the inclusion of petroleum imports to the many refineries located along the Mississippi River, and in spite of the very strong local support, the project under, normal procedures of review and comments by other agencies, could require up to a decade before implementation, during which time the export opportunities of the Nation could be lost. It is essential that the administration and Congress require an expedited review by interested agencies so that Congress can consider authorization and funding at an early date (i.e., enact fast-track port deepening legislation).

Question 5. Colonel, the Port of New Orleans is just one of many ports on the Gulf Coast and in the East which is being targeted for expansion. To my knowledge, however, there has never been a comprehensive national study to determine which ports would be the best to expand, and to what depth such expansion should go. Do you feel there is any danger of America's ports reaching excess capacity? How might our port expansion plans be prioritized, so as to minimize the costs to the Federal Government and the American public?

Answer. Congress is providing the legislation which will require the local authorities to amortize all new waterway projects. This will require that user fees be imposed. The market place, the most impartial arbitrator, will determine which projects are economically feasible. Those that are will be built; those that are not will fall by the wayside.

Question 6. I understand that you endorse the establishment of "user fees" to help pay for port expansions around the country. Please describe in detail how you feel such fees should be applied (to vessels according to type of cargo, weight of cargo, weight of vessel, etc.).

Answer. This is a very complex question involving a project authorized and implemented forty years ago and a new project, both of which are in the same location and will continue to coexist. The Port of New Orleans, the designated State agency for local cooperation for the new project—the existing project is entirely a federal responsibility—generally prefers a tonnage tax assessed against vessel using the deeper channel and benefiting therefrom.

Question 7. Much has been written and discussed in recent months about the possibility of bringing so-called "super barges" to ports like New Orleans as an alternative to deep-water dredging. These super barges, I am told, could literally swallow up inland water barges and deliver coal to foreign destinations without barge unloading. Can you tell us more about this proposal? What about other proposed technological advancements which might serve as alternatives to dredging?

Answer. Because of the tremendous economies of transportation resulting from the use of larger vessels, many schemes have been proposed. One that was developed in the Port of New Orleans is the Seabee and LASH vessels although this method of handling cargo has not shown significant development in recent years. Several schemes for "topping up" large vessels once they reach the Gulf have been proposed and Sea Container Group has announced a plan for construction of a floating coal terminal with a 25,000-ton capacity. This scheme anticipated Title XI financing for the vessel. Another is the Capricoal vessel proposed by Capricorn USA, Inc. This is a larger version of the Seabee vessel using jumbo river barges. All schemes are experimental and as yet untested. The world fleet of bulk vessel is rapidly shifting to vessels larger than PANAMAX size. Vessels over 60,000 dwt tons represented only 2% of the world's fleet in 1964 but already represent over 40% of the world's fleet today. These new, large vessels will be carrying coal well into the next century.

PREPARED STATEMENT OF DR. JOHN C. MARLIN

I am John Marlin, executive director of the Central States Resource Center, a non-profit conservation organization based in Urbana, Illinois. We are an affiliate of the Coalition for Water Project Review.

There is no compelling environmental reason why the United States in general and Illinois in particular cannot become a major supplier of the world's coal. Given the current unstable nature of the free world's sources of oil and coal it is essential for world peace that dependable energy supplies be found. Indeed the political stability that could result may help prevent a war that would destroy the global environment.

If the development of coal export facilities proceeds with sensitivity to social and environmental concerns, there is little reason to expect trouble from major environmental organizations. By this I mean the facilities must be needed, economically justified, and located to cause a minimum of environmental damage.

The main concern of environmental organizations is the haste with which regional economic interests are rushing to authorize dredging of their favorite ports to a depth of 55 feet. The many bills introduced to speed development and elude environmental regulations are ample proof of this. The majority of the nation's major riverine estuaries and many coastal wetlands will be lost forever if all potential ports are developed. There is a need to develop port capacity. There is no need to develop all ports.

The dredging of deep ports will create a number of environmental costs. First is the physical disposal of dredge spoil. Placing it in wetlands destroys thousands of acres of irreplaceable habitat that forms the foundation of our marine fishing industry and much recreational hunting and fishing. These wetlands will be sorely missed as the world's demand for protein increases. There is little doubt in my mind that the wetlands have far more long term economic value than any reasonable amount of export traffic. Disposal in dikes or at sea are other alternatives. The environmental costs and benefits of these methods require study.

Spoil often contains toxic chemicals and heavy metals that are reintroduced into the water when stirred by dredging. For this reason care must be taken to understand the chemical nature of spoil from individual sites before it is moved. The former director of the Illinois Environmental Protection Agency has predicted that polluted sediments stirred up by barges will soon be the major source of pollution in the Illinois River.

Changing the hydrologic characteristics of river outlets by deepening or relocating can cause saltwater intrusion which destroys habits and pollutes sources of municipal surface and groundwater. The problems created in St. Bernard's Parish, Louisiana by the Mississippi River—Gulf Outlet illustrate this point.

Altering the dynamics of sediments transport could have long-term impacts on the stability of the coast and barrier islands where erosion is already a problem. The relationship between coastal erosion and sediment trapping requires study.

There is an appalling lack of comprehensive data on the impact of navigation on the dynamics of aquatic ecosystems. These impacts cannot be understood without studying the systems. A good data base would take much of the guesswork out of environmental impact statements. This would surely help speed things up.

Many potential environmental problems could seemingly be overcome by locating a loading facility offshore and moving coal to it by small ships or conveyors. This alternative bears study.

The beneficiaries of any port or channel deepening effort should pay the cost of such work. If users must pay, the developments will be promoted because they are needed. Far too much environmental damage has occurred because the federal government pays the cost of river projects. Industry takes the attitude that free projects can't hurt them and might help them. Since there is no cost, developers support federal projects everywhere.

Proponents of coal export are seeking vast sums of public money. Over $1.5 billion is required to deepen just four ports. The annual maintenance cost at New Orleans alone will exceed $75 million. If the government pays the cost, over 20 ports will have to be deepened to get the Congressional votes for the few that are really needed.

Much attention has been given to improving the inland waterway system to move export coal. It should be remembered that the government currently pays more than 40 percent of the cost of moving freight by barge. The greatest beneficiaries of this subsidy are coal and oil companies which move over half the tonnage on the Mississippi system. This subsidy is great for mines and elevators located along the river, but it hurts industries that are landlocked and must rely on railroads. This subsidy distorts the economics of moving coal and the regional distribution of mines and port facilities. If it is necessary to subsidize transportation, the government should subsidize each ton that moves by any mode, not just those which move in barges.

Regarding navigation, be assured that any attempt to develop a 12-foot channel on the Mississippi or extend the length of the Kaskaskia Canal will be quite controversial. Much of the Kaskaskia was ruined by the canal which is still quite unused. It would be in everyone's interest to get on with using existing developments before digging more canals in hope of creating another of the Corps of Engineer's promised Ruhr Valleys.

The environmental community is disturbed at the attempts by some to blame environmental regulations for project delays and the nation's economic ills. If the average water project takes 24 years to complete, it cannot be due to environmental laws that have existed less than 10 years. The truth is that the average is increased by projects authorized as far back as 1899 that Congress has yet to fund. For example, the Manasquan River Jetty in New Jersey is nearing completion. It was authorized along with dozens of other projects in the Rivers and Harbors Act of 1930.

Such delays are built into the venerable pork barrel system. Many projects are studied and authorized to please specific members of Congress. It may then be years before funds are appropriated. More years are consumed by deliberately slow budgeting and funding games. Projects could be greatly expedited if need rather than pork barrel politics decided their fate.

Environmental regulations have something to do with a decrease in productivity in mines. However, as the General Accounting Office has pointed out the decisions and desires of management and labor have a lot to do with the coal industry's woes. I would add to this list a long history of government policies that left oil, gas, and nuclear energy underpriced in relation to coal.

The nation's environmental laws were established because of excessive pressure being placed on common resources by businesses whose philosophy regarded land, air, and water as essentially free goods that are expendable. The laws require that cleaning the air and water and reclaiming the land become a normal part of doing business. This is reasonable. The destruction of these laws will take us back to the days when problems were simply created and left for future generations. The many local problems created by subsidence and "orphan" stripmines should illustrate this point.

The public interest in rivers and wetlands and clean air and water must be protected. If industry moves with these values in mind there will be must less controversy. At this point let me acknowledge that not all environmental regulations are justified and I'm sure some can be changed. However, attempts to circumvent the intent of environmental laws will be strongly opposed and eventually turned back.

Several things can be done to expedite the export of coal:

1. Examine the port development alternatives in light of economic and ecological realities and determine if ports should be dredged or offshore loading facilities developed;
2. Select one project on each coast to develop while additional studies are conducted;
3. Begin and complete comprehensive studies of the impact of navigation and dredging on environmental resources;
4. Treat the cost of environmental protection as a normal cost of doing business;
5. Require shippers to pay the cost of constructing new facilities;
6. Eliminate differential subsidies between the various modes of transportation; and
7. When problems are better understood and demand established, proceed with additional projects as needed.

There is a future for coal exports which can develop rather painlessly if those involved decide to cooperate in an atmosphere of give and take based upon sound economic and ecological principles. The alternative is decades of fighting and many losers.

RESPONSES OF DR. MARLIN TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY

Question 1. In your testimony, you suggest that initially just a few deep-water ports be targeted for expansion, as the United States prepares to increase its export of coal. What process do you propose be used to select the most important ports of expansion? How should port expansion projects be paid for?

Question 2. **Please describe in detail the ways you feel the current regulatory process for port expansion can be safely streamlined.**

DEAR SENATOR PERCY: This is in response to your request for additional information regarding our views on coal export. We suggested that only a limited number of ports be developed for 55-foot draft vessels. The reason for this is that there will not be a need for developing every major port to this depth. As you are aware, bills have been introduced to develop almost every major port in the country. This pork barrel approach is not cost-effective and would probably result in more money being spent on port development than would be realized as profits on the sale of coal.

In answer to your first question about criteria for selecting ports, we propose the following:

(1) Favor ports with a low annual operation and maintenance cost for maintaining the 55-foot depth. Ports such as New Orleans where maintenance costs are high could require up to $1.00 per ton exported just to cover annual maintenance costs.

(2) Favor ports which have large amounts of protected space available for ship berthing and shore facilities. In this instance, New Orleans would be favored because of the long distance over which the Mississippi River is navigable.

(3) Favor ports which do not currently have congestion problems or which are under-utilized. The point here is to avoid excessive concentration of our export trade which would make it vulnerable to strikes by unions, sabotage, and natural disasters. In this instance, New Orleans would not be selected because it is already the nation's leading export port, with Baton Rouge not far behind. We believe that further concentration of such critical facilities would be a national folly of the first magnitude.

(4) In terms of a Gulf location, ports with maximum accessibility to the rest of the country should be selected. A variety of Gulf ports which are not overly congested are available for the export of Illinois coal shipped by either barge or rail. Mobile is an example of such a port.

(5) It is worth noting that an off-shore facility could be served by smaller ships or barges originating at a number of locations along the Gulf or either coast.

(6) In terms of east or west coast ports, the primary consideration should be given to locations which require a minimum of dredging. For example, a port located near the mouth of Chesapeake Bay would be far more desirable than one located in its upper reaches.

(7) The ability of the channel to survive periods when dredges are inoperable or major floods are in progress should also be considered.

One item that disturbed me greatly at the hearing was the vast amount of port expansion proposed by various industries and port authorities to handle an expected 200 million tons of exports by the year 2000. The gentleman from New Orleans mentioned expansion at that location which would handle about three-fourths of the total projected exports. The combined planned capacity expansion of all ports exceeds by three-fold the capacity necessary to meet the expected demand. To allow each port to expand to whatever it desires is patently ridiculous and can only lead to a tremendous waste of private and government funds.

To answer your question about which laws can be changed to speed up port development, we would say that laws which require mitigation for damaged habitat should be strengthened so that persons who are inclined to oppose expansion can be assured that mitigation will, in fact, take place.

One of the most time-consuming elements is the preparation of Environmental Impact Statements (EIS). This process could be greatly accelerated if Congress would provide funds for the study of marine ecosystems and associated habitats. These studies should be geared to determine the ecological interrelationships that are applicable over a large expanse of the coast so that the data can be readily applied to specific port sites. This could eliminate much of the need for time-consuming data-gathering that currently is part of the EIS process. An example of such a program is the multi-agency study of Chesapeake Bay and its problems. Unfortunately, this study has recently been terminated at the very time it could provide valuable data for nearby port expansion plans. It is our belief that much of the money currently spent compiling data for the EIS program could be much more efficiently spent generating new baseline data (which in most cases does not exist) that would be applicable to a variety of projects and broaden our understanding of the requirements of the ecosystems upon which man ultimately depends.

Beyond this, we can offer no specific suggestions for speeding up the process. It should be noted, however, that most of the regulations that slow down the process were established by Congress because industry and government created many ecological and health-related problems in the past by moving too fast with development with little or no regard for environmental concerns.

We heartily concur with Congressman Simon's observation that one of the best ways to develop markets for Illinois coal is to finance hard scientific research into methods for cleaning it up so that it can meet health and environmental standards both at home and abroad. Once again, thank you for the opportunity to present our views on this matter.

PREPARED STATEMENT OF LEONARD GARDNER, ILLINOIS FARM BUREAU

Mr. Chairman, we appreciate this opportunity to appear before you today to discuss the possible ramifications of an expanded export market for Illinois coal. I am Leonard Gardner, Executive Director of the Governmental Affairs Division of the Illinois Farm Bureau, a membership organization encompassing as members some three-fourths of the farmers in the state of Illinois.

We know of no major organization in our state that has been more aggressive in its support of the development of export markets for Illinois products than has the Illinois Farm Bureau. Our organization has sponsored and has participated in a number of trade development missions in the past two decades in an effort to strengthen foreign markets for Illinois agricultural products. Thus, there can be no question about the credentials of our organization in support of expanded foreign markets. The current economic conditions facing our nation, our current balance of trade and the current conditions in the world demand that we continue in our efforts to expand the sale of U.S. products in the international market.

However, in the case of coal, the subject of today's hearing, we need to raise a word of caution as we develop that export business. Without careful consideration we may become caught up in the current enthusiasm to expand the export market for Illinois coal and at the same time erode the agricultural capability of this state which can, long-term, have an adverse effect upon our export earnings. With deliberate thought and careful planning, we are convinced that the exports of Illinois coal can be increased. But, we believe this can be accomplished with adequate protections in our programs, laws and regulations to require a reasonable reclamation of strip-mined lands so that crop production can again be forthcoming.

Last year the 475 farmer delegates who adopted the official policy of the Illinois Farm Bureau organization on state matters directed that the organization:

First, "Continue to work with private, county, state and federal groups and agencies in the development and strict enforcement of sound regulations for the reclamation of mined lands that will give proper consideration to the needs and priorities of agriculture as well as energy and which will to the extent possible protect prime agricultural lands;" second, our delegates directed that "We support a state severance tax to be paid by the coal company on coal with the reclamation of pre-law land receiving a high priority for the use of revenues raised with a portion of such tax generated to be distributed to townships based upon the acreage of pre-law mined land within the township;" third, "We will continue to work with other industry groups in the development of reasonable solutions to the problems of subsidence and means to minimize subsidence in future mining operations;" and fourth, "We will support the placing of the administration of the Surface Coal Mining Land Conservation and Reclamation Act in the Illinois Department of Agriculture."

We have urged our county Farm Bureaus to become heavily involved in reviewing proposed reclamation plans prior to the issuance of mining permits and to closely monitor such reclamation plans after mining to see if they are properly implemented. We believe that you can see from this policy position, Mr. Chairman, that the Illinois Farm Bureau is deeply concerned about the reclamation of strip-mined lands. We are also deeply concerned about the issue of subsidence which affects the surface over those areas where shaft mining has occurred. Several years ago we named a special study committee of key farmers who were knowledgeable and experienced in the problem of subsidence for the purpose of seeking new solutions to the subsidence problem. We have stimulated new interest in the subsidence issue and new research proposals to find answers to the problem, but let me assure you that we are a long way from a solution as the solutions do not come easily.

In the past year the Illinois Farm Bureau and several county Farm Bureaus have participated in a modest way in research that is being funded primarily by coal companies in Illinois and is being conducted by the University of Illinois. This research is designed to study new approaches to the reclamation of strip-mined lands for productive agricultural use. We have worked closely with the Illinois Department of Agriculture, with the Department of Mines and Minerals and with the Office of Surface Mining of the U.S. Department of the Interior in an effort to try to find the best possible means to reclaim stripped lands in order to bring them back into productive agricultural use. We have not yet arrived at the final answers for such reclamation. We have made progress, but further progress is still needed.

Based on these experiences, our recommendations to you today, Mr. Chairman, are but three:

1. We would recommend that programs to expand the export market for Illinois coal be developed with caution. Let us be sure that our enthusiasm to develop a new exportable product—coal—does not seriously negate our capability to export agricultural products because of the destruction of the agricultural land base. Coal is a valued resource, but we can export the coal from an acre only once. We can export agricultural products from an acre each year.

2. We would recommend that some means be considered in the program to export Illinois coal for a fund dedicated to further research on improving means of reclaiming strip-mined land and to solve the problems of subsidence. Farmers have developed various check-offs on some of their major commodities for the purpose of research and market development. We believe a check-off could be made from the sale of Illinois soft coal in international markets for the purpose of finding new means to reclaim land and for resolving subsidence problems.

3. We would recommend that land designated for mining be selected with due consideration of its agricultural productivity and the state of the art of mined land reclamation. Until reclamation technology is further refined and the exact status of the federal reclamation law is clarified, we would urge that mining be centered in those areas where the soil is less than Class I and II prime land quality.

Mr. Chairman, we know of your interest and leadership in export market development. We know of your leadership concerning prime farmland reclamation. We are aware of the debate over federal versus state rights in certain reclamation issues. We believe our recommendations are compatible with your concerns. We believe that with dedication and by working together we can have both—a productive agriculture and a productive coal industry in Illinois and both with vigorous export markets.

We thank you for this opportunity to appear before you. We stand ready and willing to work with you in finding answers to these challenges.

Senator PERCY. I have a short announcement from SIU. The University requests that those of you who are attending the conference after the hearing, please register sometime before the 12:30 luncheon.

If we could now have the remaining witnesses for this morning. I would like to combine panels 5 and 6. Those panels deal with the same general subject, the marketing of high sulfur coal.

The first group are our national specialists, and the second group are international specialists. If all our witnesses could be seated in the sequence that they are listed in the program, we will begin. I would also like to announce that at 11:45, just prior to my turning the gavel over to Congressman Paul Simon so that I might attend the opening of my Carbondale office, I will make an announcement of some importance to every single person in this room.

We shall now begin to receive statements, after which time the Chief Counsel for the Energy Subcommittee, Bill Strauss, former head of DOE's Office of Regulatory Policy and one of the finest staff directors that I have ever worked with, will ask further questions on my behalf.

We will begin, then, with our first witness, Mr. Donald Earnshaw, Deputy Assistant Secretary for Export Development with the U.S. Department of Commerce. Mr. Earnshaw joined the Continental Group of Stamford, Conn., in 1949. He was vice president of that company prior to entering the Department of Commerce, and he was president of the Continental Group of Europe, located in Brussels, for 3 years. Mr. Earnshaw assumed his duties at Commerce in early April 1981, and is responsible for development and implementation of the Department's program for U.S. exports. I just want to say, Secretary Earnshaw, that you and I are going to be working closely together in these next years. You are the man with responsibility for the area of trade I think is one of the most important links to a strengthened U.S. economy, exports.

Mr. EARNSHAW. Well, Senator, thank you very much. I will try to live up to those expectations. As you have said, I am new in the Government. I have been here for a couple of months, and I am certainly no expert on coal exports, but I would like to say a few words on behalf of the Department of Commerce this morning, if I may.

Senator PERCY. If you have excess luggage going back, by the way, we will have you take back a lump of coal from Illinois to put on your desk as a daily reminder.

Mr. EARNSHAW. By George, I'd love to have it. Thank you very much.

TESTIMONY OF DONALD V. EARNSHAW, DEPUTY ASSISTANT SECRETARY FOR EXPORT DEVELOPMENT, U.S. DEPARTMENT OF COMMERCE; WILLIAM W. MASON, PRESIDENT, COAL EXPORTERS ASSOCIATION OF THE UNITED STATES; ROBERT PARKS, PRESIDENT, E.E.I., INC.; ROGER LEGASSIE, ACTING ASSISTANT SECRETARY FOR FOSSIL ENERGY, DEPARTMENT OF ENERGY; ARTHUR F. NICHOLSON, COMMISSIONER, BUREAU OF PRODUCTION UTILIZATION, KENTUCKY DEPARTMENT OF ENERGY

Mr. EARNSHAW. I am pleased to appear before the Subcommittee on Energy to present the Commerce views on international utilizations of high sulfur coal. We applaud the subcommittee for having this hearing.

International coal trade and a U.S. role is clearly an issue which will contribute significantly to the shaping of the international economic policy issues of the 1980's. With our vast reserves of coal, there is an excellent opportunity for the United States to increase its exports of all types of coal and become a significant and reliable energy supplier to the world. It's especially fitting to be having this hearing on high sulfur coal in Carbondale, a city located in the State with the third largest coal reserves and the largest bituminous coal resources in the Nation.

Today I would like to speak on the importance of coal trade development, its implications to international trade policy, and the role of high sulfur coal. As you well know, the United States has more economically recoverable coal reserves than any other nation. These reserves, at least 457 billion tons, could sustain substantial increases in exports of steam coal without affecting the availability of domestic supplies. The United States, by expanding as a major international source for steam coal, can significantly reduce the world's dependence on petroleum for its energy needs.

It would be natural for countries seeking a stable energy source for commercial and political reasons to choose the United States as a major supplier. Long-term commitments or contracts between the U.S. producers and foreign buyers provide the assurance each party needs to obtain the capital for, and initiate the required improvements or investments in new equipment for production, handling, and movement of coal. The foreign buyer gains additional security against economic fluctuations, and an assured source of supply that meets established quality standards.

The United States only needs to reinforce its reputation as a reliable supplier of coal and to establish a definitive policy that the Government will not interrupt contractual arrangements unless required to do so by a national emergency. The United States has never restricted coal exports even during strikes that have reduced domestic supplies. This policy for commercial stability in coal trade also extends to allowing foreign investment in its coal projects consistent with existing Federal and State laws. Such a policy not only provides needed capital, but further binds foreign purchasers to long-term commitments to buy American coal.

In addition to trade balance benefits, substantial increase in steam coal exports could provide impetus in areas of industrial activity long neglected, specifically . . . [Interruption.]

As I said, the rebuilding of our railroad beds, increasing our rolling stock and expanding handling capabilities and efficiencies of our ports, encouraging the repair and improvement of our highway systems to serve our ports and fostering improvements to our inland waterway system.

At present, high sulfur coal finds markets in the industrial side rather than in power generation. Significant controls on combustion emission resulting from coal use are imposed by most coal importing nations which aim for a sulfur content of 1½ percent or less.

A major influence on coal quality purchasing decisions is a historic pattern of consumption. In Europe, for example, most domestic reserves are good quality, low sulfur, bituminous coals, and as use of imported coal becomes more prevalent, customers are expected to seek comparable coal properties.

While near-term U.S. coal exports may be low in sulfur, new technologies are being researched and developed that will enhance the future sale of high sulfur coal. Such technologies include flue gas desulfurization, fluidized bed coal combustion, and synthetics. Thus, long-term prospects appear good for not only the export of U.S. high sulfur coal, but also the technologies and accompanying equipment being developed in the United States to utilize all qualities of coal.

Estimates place U.S. coal exports to be one-quarter of bituminous with more than 1 percent sulfur by mid-1980. Bituminous coal with less than 1 percent sulfur and low sulfur subbituminous coal will account for three-quarters of the total coal exports.

Let me conclude by talking a little bit about the Commerce activities, and I will try to be quick.

Many programs exist within the ITA of the Department of Commerce to promote coal exports, although they are not presently exclusively devoted to coal exports. The Department of Commerce is currently examining how these existing programs and planned initiatives can be directed within current resources for special emphasis on coal exports. Mechanisms for coordinating these activities with those of other organizations with coal promotion responsibilities are also being looked at within the Department.

The Department of Commerce took an active part in the recent Interagency Coal task force. The International Trade Administration of the Department of Commerce has continued its effort to assist the U.S. coal industry to improve its export capability, to aid foreign buyers to locate suitable U.S. producers and U.S. manufacturers of coal related equipment and technology, and to identify potential purchasers for American exporters.

I don't think I will go on, I have a couple of things, but I think it's a bit redundant to discuss and conclude my prepared statement. I will only say that in my role as the promoter of exports, there is no question that coal, and certainly coal from this area, is a fundamental thrust for us in the Department of Commerce in the eighties.

Senator PERCY. Thank you very much indeed for that assurance.

Our next witness is Mr. William Mason of Island Creek Coal Sales. This year, Mr. Mason is president of the Coal Exporters Association of the United States as well. Island Creek's parent company, I notice, is Occidental Petroleum Co. The Chairman of the Board of that company, Armand Hammer, is, I think, one of the most resourceful men I have ever known. Every place in the world I go, I see him. I now promise to remind him that, even though oil and fertilizer and other things are important, coal is the real product of the future for him, the man of the future. Thank you, Mr. Mason.

Mr. MASON. Thank you very much, Senator, I will certainly relay that message to him.

It is a particular pleasure for me to be here before your session today on coal exports. It's already been a very impressive session, on which I certainly compliment you and certainly your State. As I am on the program this afternoon with more details as to my thoughts as to marketing, and as my statements will be submitted before the record, I will make——

Senator PERCY. Your full statement will be in the record.

Mr. MASON. Yes, sir. As you have stated, my name is William W. Mason, I am president of Island Creek Coal Sales Co., a major exporter of U.S. coals, and this year, president of the Coal Exporters Association of the United States. I have been in the business of marketing coal both nationally and internationally for over 30 years.

Island Creek Coal Sales Co. markets coal produced by the Western Kentucky division of Island Creek Coal Co. which is generally known to be shipped from the Illinois Basin.

The Coal Exporters Association is an association consisting of 29 members. The association has been in existence for over 35 years, and its membership is responsible for the marketing of approximately 90 percent of all the coal shipped to the export market today. CEA is an organization in the United States that represents the American coal export market and works very closely with the many visitations of foreign representatives interested in coal, both privately and governmental, and collects and disseminates statistical material on the marketing segment of the coal industry from the national and international standpoint only. It is not a commercial or sales marketing organization.

One of the main objectives of the Coal Exporters Association is to present to the foreign buyer, or the prospective buyer, the true picture of the American coal industry, along with the actual conditions that must be faced in regard to exporting coals, which includes transportation to the port, and also conditions that surround the transloading of coal at the port. These latter two points have been crucial in our exports in the last year or so.

The Coal Exporters Association is acting in all phases of governmental activities from the national level to the local level, and has been most active in Washington directly working with commerce and industry. The association has also been active in working toward the better utilization of our coal port activities.

Exports of coal has long been an important segment of our balance of payments, and while most of our export coal for the last 30 years has been predominently low sulfur, low ash, high quality coking coal, shipped from the Appalachian area, last year over 26 million tons of steam coal were shipped and loaded from this market. This has been combined with metallurgical coals and amounts to, for the record, over $4½ billion in our balance of payments. Due to the lower Btu's and higher sulfur content of Illinois Basin coal, there is a limited market abroad for this type of coal by itself.

However, with the abundance of this fuel source, there is every reason to believe with the transportation system presently available to this area, both by river and by rail, that this source can be uniformly and properly blended at the port or at the loading port. The result would be a consistent product of medium Btu, medium sulfur-content coal that can be marketed abroad. The market for higher sulfur coal, plus 2 percent, is estimated at possibly only 10 percent of the export market by 1985. Sulfur contents of 1½ to 1¾ percent range fall into the next category and might be expected to make up to 50 to 60 percent of the market by 1985.

With 135 million tons predicted to be exported by 1985, and by blending, it would seem that Illinois Basin coals could fit into the overseas market for possibly 20 to 30 million tons, maybe more. Coal is our most important energy source. This fact is more clearly recognized by our foreign friends than by our own customers. Illinois Basin coal has its drawbacks, however, this is a source of energy that must be utilized.

I congratulate the sponsors of this conference for their efforts they are making and feel that through such conference, this positive action will be taken to find better ways whereby this energy source can be utilized in the export market. Thank you.

Senator PERCY. Thank you, Mr. Mason, very much indeed.

Our next witness is Mr. Robert Parks, vice president of EEI Energy Incorporated of Illinois.

Mr. PARKS. Thank you, Senator, for giving us the opportunity to speak here this morning.

The perspective from which I am speaking is one a little different from most of those you have heard from this morning, in that the company I represent is an international coal trader, and in that perspective, we deal with most coal producers in this country, and communicate directly with many of the European customers. Our perspective is even more important to the Illinois Basin because we are a company that is grounded in river transportation and barges, and we have, for 1 year or more, done extensive exporting through the Gulf port.

From that perspective, I'd like to reflect for a few minutes, on the difficulties with which we face the exporting of Illinois basin coal. I think, sir, that one of the major difficulties we have is the commitment to export, the export business, by the producers of the Illinois basin coal. We have a situation where, for years, the producers of Illinois basin coal have been very successful in the domestic market, and the export market represents quite a change, and it is a market which has a great deal of doubts, a great deal of uncertainties facing it, and it is very difficult in our communication with the Illinois producers, to get them to leave the comfort of a domestic arrangement or a domestic commitment for the possibilities or potential of the export move.

We have a situation where they are looking at long domestic contracts—that happened very easily, they are relatively automatic, and we heard comments this morning, where people were counting on export to take up the slack of a slow domestic economy. I submit to you that we cannot look at the export market in that vain. It cannot be approached as something to take up slack from a slow economy at home.

One of the other problems we have in the Illinois basin is the individual effort in attempting to market overseas. We are, in fact, sir, a house divided against itself. We have very little cooperation from the producers, very little cooperation from many of the traders, and this creates a great deal of difficulty in getting any kind of message across to our European customers.

Just what is Illinois basin coal all about? Obviously, it's difficult to expect a lot of users long-term at export, when people are predicting that only about 7 percent of our increase in exports will be for the sulfur contents 2 and over.

The other problems that exist have been mentioned, Mr. Lee emphasized and Mr. Mason just emphasized, and that is the necessity to blend Illinois coal. It can be done, and it's something that's being done successfully, but it requires cooperation and it requires the ability to work together.

It's been mentioned many times this morning, and I will briefly mention it, the reliability factor of the United States, especially Illinois basin coal overseas, that commitment that I talk about, the quality and fulfilling of the contracts that have been made. We have done great damage in the past to buyer confidence overseas, and I don't see it changing very rapidly, unfortunately. I would also like to point out that some of the difficulties in coal in general, and the Illinois basin coal particularly, deal with the financial aspects and deal with support from the U.S. financial institutions. I think we need a commitment from the institutions, that promotion that you talked about, sir. We also need, I believe, to establish an Illinois Coal Exporters Association that would make Illinois coal known throughout the world, and I think we need Government insurance programs for foreign receivables, and we need to implement a program to encourage U.S. banks to help in the exporting of U.S. coal. Thank you.

Senator **Percy**. Thank you very much.

Our next speaker, Mr. Roger LeGassie, Acting Assistant Secretary for Fossil Energy in the Department of Energy. He assumed this position in January 1981. Mr. LeGassie began his Federal service in 1952, and took a position with the Atomic Energy Commission in Washington in 1962. He has played a major role in the development of new energy technology, and from 1967 to 1978 was chairman of the working group on research and development strategy in the International Energy Agency.

Mr. **LeGassie**. Thank you, Mr. Chairman. Let me, again, congratulate you and Southern Illinois University on the very fine conference and hearing process that you have established, and I am delighted to be a part of that process representing the Department of Energy.

I should say that we are very strongly in support of a strong U.S. entry into world coal trade. I agree that this should not be seen as a spot market opportunity; rather there is a substantial long-term role for the United States in continuing trading relationship, such as you mentioned we have established in agriculture. I think we have to work very hard toward that end.

The Department of Energy, and myself personally, were involved in the establishment of the Interagency Coal Export task force that, that first put governmental focus on this question, although we built on studies, such as World Coal Study, that had proceeded the governmental activity. The Department is in close contact with the International Energy Agency. We conduct cooperative research and development in fossil energy activities that try to insure the usefulness of U.S. coal abroad in new technologies. We are supporting the economic assessment activities of that agency which are making independent studies of world coal trade for the Europeans, and one of their representatives has a paper on the conference later on, and we have been in direct contact with the Coal Industrial Advisory Board, which consists of businessmen from the United States and from the other countries, not Government representatives, but the people in the coal-producing and buying activity, which have also advised the International Energy Agency, so we have a substantial supportive role in all of those areas. Secretary Edwards, at his confirmation hearings, made a strong statement in support of the world coal trade, and he has continued from that day to this, to personally be extremely supportive of this activity.

In Fossil Energy, we have now established a unit reporting directly to me, which is trying to coordinate our efforts within the Department to support these activities and work with other agencies, such as Commerce, and we are very supportive of Commerce's being involved in this activity. I would note, sir, since you have asked several witnesses whether we have enough coal, that just last month the Department of Energy revised its estimate of U.S. coal reserves upward to 475 billion tons, a number that was just quoted. That was an increase of 40 billion tons from the previous estimate. Between now and the end of the century, we are going to be using less than 40 billion tons, so in the year 2000, as we look backward, we are going to have more coal at the end of the century than we thought we had last month. In that kind of situation, and I haven't heard anyone put it in those dramatic terms yet, but I think you can say that to your foreign visitors, we do have a lot of coal. We are concerned, sir, to strengthen domestic demand for the use within this country of high-sulfur, midwestern and eastern coals to give an economic base that will then allow for an additional export activity. Our first priority is, in fact, to increase coal usage in this country and then, from a strong industrial base, to be able to move into world trade. We are also, in the Department, focusing on new technologies which will allow worldwide use of the fluidized bed or coal gasification technologies for this kind of coal. But in the end, the Government won't do it; industry has to do it; the private sector has to do it. We want to be supportive, and working together, we can make this happen. Thank you, sir.

Senator PERCY. Thank you very kindly. Our next witness is Mr. Arthur Nicholson, commissioner of the Bureau of Production and Utilization of the Kentucky Department of Energy.

Mr. NICHOLSON. Thank you, Mr. Chairman. I am pleased to have this opportunity to discuss with you this important topic of the marketing mechanisms for the export of high-sulfur coal, and I applaud your concern of these matters. I am confident these hearings will result in useful actions to mitigate the problems of exporting high-sulfur coal. Although many of the points in my paper have been covered in considerable detail, I would like to summarize some of the same points with a little more emphasis. Except for limited specific situations, potential coal users in Western Europe are looking for low-sulfur coal. Western European air pollution control strategies and abatement options are described in the second part of our written statement. It may be seen that technology for burning high-sulfur coal lags the U.S. experience. Given the slowness of U.S. utilities to install scrubbing equipment that will permit the utilization of high-sulfur coal, it seems reasonable that some stimulus must be given to the European utilities if they are to design boilers for use of high-sulfur coal. This stimulus must be a new type of sale effort, one that is long term and that meets the competition in terms of cost, reliability, and environmental concerns.

It is our opinion that the most critical mechanism needed is demonstration that high sulfur coal can be burned in accordance with the environmental standards at a competitive cost, and to insure that the coal will be produced and shipped when needed. This entails a two-part strategy which I'd like to mention very briefly.

We must establish credibility for our product by using more of it ourselves instead of high-cost oil from the Arab countries. Second, it is crucial that there must be mechanisms for assuring the foreign market that the supply of coal is reliable. Reliability of supply has even more overtones in an export market than in a domestic market where producer or transportation work stoppage are the chief concerns. There are at least two other important considerations in an export market. The political stability in the exporting country and the likelihood of obtaining export permits certainly are significant considerations in reliability.

Another one that hasn't been touched on quite as strongly is the willingness or capability of the seller to fulfill the contract when better market opportunities or unforeseen problems arise. This last consideration is especially important when small companies are involved.

I will mention very briefly our Kentucky experience. Our marketing effort has been to develop a synfuel industry in western Kentucky to provide a market for our high sulfur coal and the Illinois Basin coals, and to work for an export market for eastern Kentucky coal. Eastern Kentucky is characterized by a large number of independent producers who individually cannot serve the export market. Most of these independent producers lack the reserves sufficient to fulfill long-term contracts. They also lack the financial resources to deal directly with foreign markets. Our initial thought was to establish a producers' cooperative that would include enough coal resources to support a long-term contract. However, a cooperation by itself is insufficient. There is still the problem of reliability of supply.

A cooperative may not be strong enough to insure that all members meet their contractual obligations. We found it necessary to establish an Export Resources Authority, a nonprofit public corporation to perform certain functions in the Commonwealth's best interests. The authority is able to assure foreign buyers that coal having desired qualities will be produced and shipped according to the buyer's schedule. Through this mechanism, we believe we can act as a conduit between our independent producers and the export market.

In brief summary, sir, it is our opinion that the most critical mechanism needed to market high-sulfur coal is to demonstrate that high-sulfur coal can be burned in accordance with environmental standards at a competitive cost, and to insure that the coal will be there when needed. We do not believe enough is being done to convince overseas markets at this time. Thank you, sir.

Senator PERCY. Thank you very much indeed.

[The prepared statements of Messrs. Earnshaw, Mason (with attachment), LeGassie, and Nicholson follows. Responses to written questions submitted by Senator Percy to Messrs. Earnshaw, Parks, and LeGassie, also follow:]

PREPARED STATEMENT OF DONALD V. EARNSHAW

I am pleased to appear before this Subcommittee on Energy to present the U.S. Department of Commerce views on international utilization of high-sulfur coal.

We applaud this Subcommittee for having this hearing. International coal trade and the U.S. role is clearly an issue which will contribute significantly to shaping the international economic policy issues of the 1980's.

With our vast reserves of coal, there is an excellent opportunity for the United States to increase its exports of all types of coal and become a significant and reliable energy supplier to the world.

It is especially fitting to be having this hearing on high-sulfur coal in Carbondale—a city located in the State with the third largest coal reserves and the largest bituminous coal resources in the Nation.

Today, I would like to speak on the importance of coal trade development, its implications for international trade policy, and the role for high-sulfur coal.

As you well know, the United States has more economically recoverable coal reserves than any other nation. These reserves, at least 475 billion tons, could sustain substantial increases in exports of steam coal without affecting the availability of domestic supplies.

INTERNATIONAL ECONOMIC POLICY IMPLICATIONS

The United States, by expanding as a major international source for steam coal, can significantly reduce the world's dependence on petroleum for its energy needs. It would be natural for countries, seeking a stable energy source for commercial and political reasons, to choose the United States as a major supplier.

Long-term commitments or contracts between U.S. producers and foreign buyers provide the assurance each party needs to obtain the capital for, and initiate required improvements or investments in, new equipment for production, handling, and movement of the coal. The foreign buyer gains additional security against economic fluctuations and an assured source of supply that meets established quality standards. The United States only needs to reinforce its reputation as a reliable supplier of coal and to establish a definitive policy that the Government will not interrupt contractual arrangements unless required to do so by a national emergency. The United States has never restricted coal exports, even during strikes that have reduced domestic supplies.

This policy for commercial stability in coal trade also extends to allowing foreign investment in its coal projects, consistent with existing Federal and State laws. Such a policy not only provides needed capital but further binds foreign purchasers to long-term commitments to buy American coal.

MAINTAINING A STRONG DOMESTIC INDUSTRIAL SECTOR

In addition to trade balance benefits, substantial increases in steam coal exports could provide impetus in areas of industrial activity long neglected, Specifically: The rebuilding of our deteriorating railroad beds; increasing our rolling stock and expanding the handling capabilities and efficiencies of our ports; encouraging the repair and improvement of our highway systems serving our ports; and fostering improvements to our inland waterway system.

HIGH SULFUR COAL EXPORTS

At present high sulfur coal finds markets in the industrial use side, such as cement and lime kilns, rather than in power generation. Significant controls on combustion emissions resulting from coal use are imposed by most coal importing nations which aim for a sulfur content of 1.5 percent or less.

A major influence on coal quality purchasing decisions is the historic pattern of consumption. In Europe, for example, most domestic reserves are good quality, low sulfur bituminous coals. As use of imported coal becomes more prevalent, customers are expected to seek comparable coal properties.

While near-term U.S. coal exports may be low in sulfur, new technologies are being researched and developed that will enhance the future sale of high sulfur coal. Such technologies include flue gas desulfurization, fluidized bed coal combustion, and synthetics. Thus long term prospects appear good for not only the export of U.S. high sulfur coal but also the technologies and accompanying equipment being developed in the United States to utilize all qualities of coal.

Estimates place U.S. coal exports to be one quarter bituminous with more than one percent sulfur by mid 1990. Bituminous coal with less than one percent sulfur and low sulfur subbituminous coal will account for three quarters of total coal exports.

DEPARTMENT OF COMMERCE ACTIVITIES

Many programs exist within the International Trade Administration of the Department of Commerce to promote coal exports although they are not presently exclusively devoted to coal exports. The Department of Commerce is currently examining how these existing programs and planned initiatives can be directed within current resources for special emphasis on coal exports. Mechanisms for coordinating these activities with those of other organizations with some coal promotion responsibilities are also being looked at within the Department.

The Department of Commerce took an active part in the recent Interagency Coal Export Task Force. The International Trade Administration of the Department of Commerce has continued its efforts to assist the U.S. coal industry to improve its export capability, to aid foreign buyers to locate suitable United States producers and U.S. manufacturers of coal related equipment and technology, and to identify potential purchasers for American exporters.

The International Trade Administration has some 40 programs and activities designed to assist exporters of all levels of potential and capability. Many of these programs are particularly suited to assist in the promotion of the export of United States coal. Specific plans have been formulated to cooperate with U.S. industry in carrying out an extended program to promote coal exports.

This concludes my prepared statement, Mr. Chairman. I will be pleased to respond to your questions.

Responses To Written Questions Submitted by Senator Percy to Mr. Farnshaw

Question 1. Describe the ways in which the Department of Commerce is working with American coal producers to pave the way for new foreign markets? What new programs are being initiated by the Reagan Administration in this regard?

Answer. The Department of Commerce has initiated several specific actions to increase U.S. coal exports. Chief among these actions are: prepared market profiles on each of the major foreign demand markets for U.S. steam coal, as well as on other coal supplying countries; expanded the Standard Industrial Classification for coal to better identify export opportunities for U.S. coal exporters; developed an Export Contact List file which includes data on potential importers, distributors and other foreign buying concerns for U.S. coal initiated proceedures to provide in-depths itineraries for visiting foreign coal buying delegations; developed a U.S. coal contact list; and designated a Commercal officer in each of thirty U.S. embassies to handle coal-related matters.

Beginning October 1, 1981, the Department of Commerce will implement a comprehensive coal export promotion campaign that will include domestic seminars, trade missions to foreign coal demand markets, and business counseling for U.S. coal companies.

Below is a more detailed description of each of these activities:

The Commerce Department will hold coal export seminars at locations in the U.S. where coal is produced, marketed or exported. These seminars, which will complement private sector, state and local government promotional activities, will be designed to publicize U.S. coal export opportunities and overseas marketing techniques. Special information will also be provided on the development of coal transportation systems including port development and channel dredging;

We will schedule coal trade missions involving the U.S. coal industry, state and local government entities, coal associations and transportation authorities. These missions will visit major coal consuming nations to encourage coal trade development and to demonstrate the commitment of U.S. coal suppliers over the long-term; and

The U.S. Commercial Service will provide special coal export counseling services at its 47 district offices to assure that private entities, state and local governments are aware of coal export opportunities

In addition, a Coal Interagency Working Group (CIWG) has been formed to implement the Administration's coal export development policy, Assistant Secretary for Trade Development W. H. Morris, Jr., has been appointed chairman. This group is comprised of policy-level representatives from those federal government agencies which are directly concerned with production, transportation and exportation of coal.

Question 2. What kind of communication link now exists between the International Trade Administration and the commerce and energy research departments of the coal-producing states around the country, to maximize marketing opportunities for our coal? What more can be done?

Answer. The U.S. Commercial Service (USCS), through its 47 district offices, counsels and encourages firms to initiate or expand their export efforts. These offices are coordinating their efforts in dissemination of information on coal export opportunities to the U.S. coal industry with pertinent entities in the coal producing states.

We are working closely with a newly formed Coal Industry Export Council, the National Governors Association, and the Appalachian Regional Commission to ensure private industry participation, on a continuing basis, in the planning of all Commerce coal export activities.

Question 3. What parts of the Interagency Coal Export Task Force report are endorsed by the current Administration? What parts are disputed?

Answer. The Reagan Administration does not endorse any particular part of the ICE report. Rather, it considers the report to be a valuable resource document which will be used by the Coal Interagency Working Group in their evaluation of the impediments to coal exports.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY TO MR. PARKS

Question 1. Mr. Parks, I understand that you are a representative of Illinois' only licensed coal broker, but that you have not recently been involved in any sales of Illinois coal. Why is this?

Answer. The price-quality relationship of Illinois coal has not been well suited for our export orders. From the quality side the sulfur is on the high side (2% plus). The price F.A.S. New Orleans is generally higher than similar coals from Indiana, Western Kentucky, Ohio and Arkansas. This combination is very difficult to overcome.

Question 2. What use can brokers like yourself be to Illinois Coal Producers in the coming year, in their pursuit of foreign coal markets?

Answer. The strength of a broker compared to an Illinois Coal Producer is his knowledge of the foreign markets and specific customer needs. A broker can provide the Producer a tremendous marketing asset through his strong customer relationships and his skill at matching coal qualities to customers' coal needs. For Illinois Producers a skilled broker can identify specific opportunities where higher sulfur coal can be used 100% or where it can be mixed to achieve the desired specification.

Senator, selling high sulfur coal in any market takes all the skill and imagination we can muster. Brokers provide a specialized talent in this area—a talent that should be used.

PREPARED STATEMENT OF WILLIAM W. MASON

My name is William W. Mason. I am President of Island Creek Coal Sales Company, a major coal exporter of U.S. coals, and this year I am President of the Coal Exporters Association of the United States. I have been in the business of marketing coal both nationally and internationally for over 30 years.

Island Creek Coal Sales Company markets coal produced by the West Kentucky Division of Island Creek Coal Company, coal which is in the area generally known as the Illinois Basin.

The Coal Exporters Association is an association consisting of 29 member companies. The association has been in existence over 35 years, and its members are responsible for marketing approximately 90 percent of all the coal shipped to the export market.

CEA is that organization in the United States that represents the American coal export market and works closely with the many visitations of foreign representatives interested in coal, both private and governmental, and collects and disseminates statistical material on this marketing segment of the coal industry from an informational standpoint only. It is not a commercial or sales marketing organization.

One of the main objectives of the Coal Exporters Association is to present to the foreign buyer or prospective buyer the true picture of the American coal industry along with the actual conditions that must be faced with regards to exporting coal which include transportation from the mine to port and also conditions that surround the transloading of coal at the port. These latter points have been crucial in our exports the last year or so.

The Coal Exporters Association is active in all phases of governmental activities from the national level to the local level, and has been most active in Washington lately working with Commerce and Energy. The association has also been active in working toward the better utilization of our port facilities.

Exports of coal have long been an important segment of our balance of payments and while most of our export coals for the last 30 years or so has been predominantly low sulfur, low ash, high quality coking coals shipped from the Appalachia area, last year over 26 million tons of steam type coal was shipped in total to this market. This, combined with the metallurgical coal, amounted to a record $4.5 billion in trade balance.

Generally, the steam market abroad wants coals that are as high as possible in heat value and under 1½ percent in sulfur content. There is a market, however, for coals in the 11,500 to 12.000 BTU range and up to 2½ percent in sulfur.

Because of the lower BTU value and higher sulfur content of the Illinois Basin coals, there is a limited market abroad for this type of coal by itself; however, with this abundant fuel source, there is every reason to believe, with the transportation system presently available from this area—both by river and by rail, that this source can be uniformly and properly blended at the port or at the loading point. The result would be a consistent product of medium sulfur content that can be marketed abroad. The market for higher sulfur coal—plus 2 percent—is estimated to be possibly 10 percent of the export market by 1985, however, sulfur content in the 1½ to 1¾ percent range could fall into the next category that is expected to take up to 50-60 percent of this market by 1985—using 130 million tons of export market coal by 1985 and factoring for blending, it would seem that Illinois Basin coals could be shipping overseas 20–30 million tons of steam typo coals within the next four to five years—maybe more. A new market for this coal.

Coal is our most important energy source—this fact is more clearly recognized by our foreign friend than by our own countrymen. Illinois Basin coals have their drawbacks, however, they are a source of energy that must be and should be utilized.

I congratulate the sponsors of this conference for their efforts they are making and I feel that through such a conference as this, positive action will be taken to find better ways and means whereby this energy source can be utilized in the export market.

ATTACHMENT TO MR. MASON'S PREPARED STATEMENT

FACTORS AFFECTING INTERNATIONAL UTILIZATION OF HIGH SULPHUR COAL

Thank you Mr. Chairman and good afternoon ladies and gentlemen. It is a pleasure for me to attend and to be a part of this conference on the marketing potential of high sulphur coal into the export market. In doing so, I should first like to give you a brief history of the exports of U.S. coal abroad; also outline a few things my company is doing in the line of transportation to increase U.S. exports; give you a few comments on the export market as I see it now and in the future; comment on the transportation and port constraints which this past year have had a great impact on our marketing capabilities abroad and then give you a few of my observations as to the markets abroad for high sulphur coals and what we can do to expand these markets in the coming years.

To start on the positive side, I and my company are bullish on the future of the marketing opportunities of coal in the 1980's and 1990's. To support this confidence, my parent company, Occidental Petroleum Corporation, is backing our future course with capital investments of several hundred millions of dollars in mines, transportation equipment and terminals.

As I am sure a number of you know, the U.S. has exported coal predominently from our eastern coal fields for almost one hundred years. While our export market for coal has not been a major market—averaging about 10 percent of our annual production—it has been an important market. Prior to and following World War I, coal was exported to Europe in fairly good quantities for steam and heating use. Coal was exported all through the 30's in varying quantities primarily to Europe and Canada. During this period too, most of the coal exported was designated as steam coal with most of it moving through our eastern and lake ports. In 1947, following World War II, we had a banner year when we exported over 68 million tons. This was mostly steam coal shipped from our eastern ports and mostly in 10,000-ton liberty vessels. To a great extent, this coal moved to Europe for their rebuilding and reconstruction of this war-torn area.

In the 1950's, 1960's and 1970's with the exception of Canada, the demand shifted from steam coal to coking coal. This was the period of the development and construction of the many steel mills around the world that used and required as a base-coking coals from the United States. Japan became our largest single receiver of American coals, and in 1975 received from the United States over 27 million tons, or over 40 percent of all the coal exported. During this period coking coal was shipped to almost every country in Europe with a steel plant and also to the developing area of South America—Brazil, Argentina and Chile.

It was not until 1979 that the market overseas began to again shift the steam coal. In 1979 out of a total of 51 million tons exported, excluding Canada, only about 2.4 million tons was categorized as steam coal; the remaining being coking or metallurgical type coal. Why did this take place? If you will recall, this was the year of the big jump in oil prices. Europe, which was almost entirely dependent upon mideastern oil, concluded that the time had come when they could no longer depend upon, nor pay the price of, energy from oil and looked to alternate sources. Coal, and American coal in particular, appeared to be the answer, so in 1979 and 1980 we had many delegations visit our country to explore the possibilities and potentialities of securing coal for the conversions and expansions of their utility and steam requirements. Japan and the Far East, also heavily dependent upon foreign oil, began to look to other fuel sources; and while Australia, Western Canada, Poland and South Africa were their more natural sources of supply, they too began looking to the United States as a source.

In 1980 we exported almost 90 million tons of coal. Of this, 63 million tons was metallurgical, with the remainder steam, which was a great increase from the previous year. This year, 1981, we had earlier predicted and expected to ship about the same amount as last year, however, with the UMWA shut down, this forecast will no doubt be downgraded, although I feel with the resumption of operations, the export market will pick up rapidly. I must say here that we have lost some credibility among our foreign customers and potential customers by our inability to perform in the manner in which they would desire during these last couple of months.

As I previously mentioned, I would like to tell you a few things my company is doing with regard to mining and transportation that I feel will assist in the marketing of Illinois Basin coals.

At Island Creek we currently have recoverable reserves of 3.8 billion tons. We are bringing on new mines which will increase our production capacity beyond 33 million tons per year. Our plans call for continued growth through the 1980's and ensuing years, in production and distribution terminals.

The concept to develop river terminals and other transportation needs at Island Creek came about in 1977. Our long-range and strategic planning revealed that we needed to become less dependent on historical distribution methods that restricted our growth and affected our ability to mine and deliver coal.

We therefore embarked on a program to define the transportation bottlenecks that were adverse to our marketing plans. To this extent, we first acquired 525 railroad cars, at a capital investment of 16 million dollars, to ease the railcar problem. Next, we turned to Mr. Reliable, "Old Man River." We found the barge lines most cooperative in our plans for increasing coal haulage. Our river coal shipments amount to several million tons annually. Our examination of the river systems told us it had the capacity and could handle increased volumes. The rivers had demonstrated in the past the ability to handle some 130 million tons annually, despite certain interim lock and dam bottlenecks. We felt it was truly our best avenue for expansion of markets. We also saw the need for adequate intermodal facilities.

We then began our development of new river terminals for the movement of additional coal to both the domestic and export markets. At present, there are three river terminals in operation. Their capital investment approximates over 70 million dollars. They are under the operation of Occidental's subsidiary, Kentucky-Ohio Transportation Company (KOT).

A—The Big Sandy Terminal is located on the Big Sandy River south of Catlettsburg, Kentucky. It currently receives its coal by highway.

B—The South Shore Terminal, located at South Shore, Kentucky, on the Ohio River is served by the highway and the Chesapeake and Ohio Railroad. It was completed in April 1980, loading out its first barges and rail coal.

C—The Wheelersburg, Ohio Terminal is also located on the Ohio River. It is served by the Norfolk & Western Railway. It commenced receiving coal this past December.

These terminals, for the most part, load fifteen barge tows hauling 22,500 tons each with sufficient fleeting areas for jumbo and even 3,000 ton super barges.

The barges navigate the Ohio, Tennessee and Mississippi River systems to domestic, utility and industrial plants. Coal will also be transshipped through the Gulf for export movement.

KOT is developing a coal storage terminal at Baltimore or commonly known as Curtis Bay. Not only will KOT have a sophisticated transportation and ground storage facility, but its own ship and barge pier to go with it. Construction has been underway since July 1980.

Currently under extensive study is development of an additional facility in the Portsmouth, Virginia area.

As you can see, Occidental has backed its hand through investment in railcars and terminals towards building a transportation network to support our coal marketing programs. There is still much to be accomplished in order to achieve a more efficient program for the movement of U.S. coals. This includes Eastern and Western, both steam and metallurgical.

Now to the future and what is needed. What will the future hold? According to the World Coal Study, the Interagency Coal Export Task Force and National

Coal Association forecasts, there is a healthy demand worldwide for steam coals. While these and other studies may disagree on an exact level for this demand, they do concur that the "order of magnitude" is sufficient to warrant an expansion in this country of our marketing capabilities directed toward meeting overseas demand. We already have sizable excess production capacity to support increased exports, and we can readily add to this capacity as needed.

To demonstrate this "order of magnitude," consider these ranges of tonnage forecasts starting with 1985.

For Western Europe alone, the imported steam coal demand is forecast in the range of 100 to 125 million net tons. By 1990, this range is expected to be 150 to 190 million tons. By 2000, the range is expected to be 270 to 340 million.

Even if imports actually fall on the low side of these ranges, they clearly demonstrate that a large market for steam coal is rapidly developing in Western Europe alone.

Turning to the Pacific Rim area, which includes Japan, Korea and Taiwan, projections also abound, but the ranges of these projections are not as extreme. For 1985, steam coal import requirements are forecasted at 40 million tons, the 1990 forecast is 90 million and by the year 2000 imported coal demand is projected to be above 200 million tons.

Totaling these projections and using the low figures in the ranges, we obtain the following forecast figures for imported steam coal demand in these two major overseas markets—Europe and Pacific Rim: 1985, 140 million tons; 1990, 240 million tons; and 2000, 470 million tons.

The National Coal Association report also makes this projection for world metallurgical and steam market import requirements. The forecast shows a total import range of 274 to 343 million tons of coal for 1985 as compared to 243 million tons in 1979. By 1990, this range is projected to increase from 382 to 467 million tons. The United States is expected to supply 30 plus percent of this demand. Other studies concur that the United States could supply a third of the world's coal demand from imports.

For the United States to increase exports over the long term, additional terminal and transportation capacity will be required. Terminals are being added at Baltimore. Others are being planned at Norfolk and at other East, Gulf and West Coast areas to be served by barge and by railroad. In addition, a number of improvements have been made at existing facilities of the Chessie and N&W at Hampton Roads, along with those in the New Orleans and Mobile area. New river terminals have also been developed to support export movements via our inland waterways. Therefore, affirmative action is being taken to increase our nation's future port capacity. At last count, some 37 terminals already have been announced as being built throughout the country with a capacity of 479 million tons by 1985. How many of these facilities will materialize and at what actual capacity remains to be seen.

By no means do we down-play what the railroads have done in improvements to their plan and rolling stock, nor the equipment investments being made by the trucking and barging companies. Pipelines are also being considered to transport the coal in slurry form. These elements contribute significantly and are essential to our delivery capabilities.

While the private sectors have reacted expeditiously to the obvious market potentials and have begun to commit investment dollars, there still needs to be accelerated action on the part of government.

Take dredging. Currently, all of our major coal ports, and all of those proposed, have channels at 45 feet or less. This means that the maximum size vessel that can depart fully loaded is Panamex size on the order of 60,000 to 70,000 tons. Only one port, Hampton Roads, can handle vessel loads of 100,000 tons or just slightly greater. Ocean freight costs per ton are $5 to $7 per ton lower in a 150,000 ton vessel as compared to those of 100,000 tons. Freight costs quickly escalate for vessels below 100,000 tons Our world competitors now have and continue to build facilities to load these larger colliers.

The Army Corps of Engineers has the responsibility of dredging and maintaining channels and harbors, but before work can begin deepening those channels, feasibility studies and environmental impact statements must be prepared and approved. Permits must be obtained. Finally, monies must be authorized and appropriated by the Congress for these river and port projects.

We are encouraged by the number of proposals introduced in the 97th Congress thus far, which among other things would accomplish:

Dredging harbors and channels on the East, Gulf and West Coast to depths of 55 feet or more.

"Fast Tracking" the environmental review and permitting process for both shoreside facilities and for port and harbor improvements, etc.

We recognize the fact that future federal funds might not be made available for dredging programs. Therefore, the coal industry must make further commitments to insure its destiny. In this regard, if the administration will "fast track" its permitting and environmental policies, then we are prepared to commit to pay our fair share of dredging expenses. Such a position has been adopted by the coal companies under the National Coal Association.

Another major item of importance pertains to rail freight rates. More cooperation and understanding is needed from our railroads in the setting of rates to tidewater and river ports. These rates, when coupled with the investments in terminals, vessel loading delays and demurrage make the total in-vessel cost for U.S. coals even less competitive with other foreign coals. We do not imply that our railroads should not be profitable or make a fair return in the pricing of their services. However, they need to provide some form of freight pricing stabilization to encourage exports and intermodal movements. Contract rates and tonnage guarantees would be one means to insure carrier revenues.

Illinois Basin coals have historically and predominantly moved to and served the domestic, industrial and utility markets—and to some extent, the metallurgical market—in the nearby midwestern area. This has been a good and dependable fuel source for this area and, to a great extent until the last ten years or so, satisfied the area's productive capacity. Unfortunately, while U.S. production has increased in recent years, Illinois Basin coals have not enjoyed this increase in demand. It feel this has been due to several factors—(1) Illinois Basin coals are a bit lower in heat content than eastern coals, however, when cleaned, generally can be in the 12,000 Btu range. (2) Illinois Basin coals have generally moved by river and rail to markets within a several hundred mile range. (3) Illinois Basin coals have heretofore not moved to the export market due to their location being in mid-America, but more so, steam coals until very recently, have not been exported to any great extent except to Canada. (4) Illinois Basin coals have been more affected by the influx of gas in the metropolitan areas and the environmental restrictions instituted by the EPA due to the higher sulfur content of most of the coals originating from his area. While there may be other reasons, I feel that these fairly well cover the reasons behind the static or declined use of Illinois Basin coals.

From a reserves standpoint, this area is a vital energy source, estimated to have over 200 billion tons of identifiable and recoverable reserves. The area has a number of our nation's best and well-qualified producers; this area has a mature and stable labor force and, with the growing demand for steam and industrial coal abroad and with a transportation network comprising of the Mississippi River and progressive railroads, it would seem that there is no reason why these coals of better than average quality should not find their place in the energy-short areas of Europe and the Far East.

The one and only reason why Illinois Basin coals would not be marketable in the world market is the higher sulfur content of these coals. Export coal buyers generally fall into four general categories of sulfur specifications: Under 1 percent; up to 1½ percent: 1½ to 2½ percent; and 2½ to 3½ percent.

Illinois Basin coal by itself cannot fit easily into the first two categories. Some coals from this area might fit into the third category, with more falling into the last category. The larger percentage of utility and industrial coal demand now falls in the third category—1.5 to 2.5 percent sulfur.

As I see it, the best way for these Illinois Basin coals to fit into the growing export market is by utilizing a blending procedure at port in or around the New Orleans area. Lower sulfur coals from the eastern area—up the Ohio—can be loaded by barge and assembled with barges loaded on the lower Ohio or Mississippi River to meet the required sulfur specification when loaded into vessels at the port. Barges can be transloaded intermittently or loaded from storage to insure the needed quality. Many Illinois Basin coals can be loaded directly to the river, thus reducing the cost of transportation. You also have an excellent railroad system that serves your area and the ports of the South. In utilizing your railroad system, blending of coals would probably be most effective by combining river movement lower sulfur coals with higher sulfur Illinois Basin coals at one of the terminals in the port area.

The demand for steam coal overseas will be great in the years ahead, and with the capacity that presently exists in this area for producing coal, the transportation system that is already available and proper coordination and planning, I can see no reason why Illinois Basin coals should not find a more prominent place in the export market.

We hear today much about our having an energy crisis. We in this country have no energy crisis. Our country is blessed with an abundance of energy or potential energy. We have an oil crisis—we are dependent upon foreign oil at whatever price it may be. We should make use of our coal resources.

In conclusion, I feel that the coal industry can be optimistic about the opportunities for export coals and in attaining successful long-term marketing programs. We have much to gain if we react expeditiously to this rapidly developing worldwide coal demand.

Finally, our nation, our state and our industry must demonstrate to those here at home and throughout the world that we have the resources and capabilities to produce and supply both the needs of the United States and those abroad with our most abundant fuel source—coal.

Thank you.

EXISTING, PLANNED, AND ANNOUNCED PORT CAPACITY FIGURES

[In millions of tons]

	1981/82	1983/84	1985/86
A. EAST COAST			
1. Cast Group, Port of Quebec, Canada	6	20	20
2. Atlantic Cement, Albany, N.Y	1	2	2
3. New Amsterdam Coal, Albany, N.Y	2	4	4
4. United States Steel, Fairless Hills, Pa		3	10
5. Alla-Ohio Valley Coal, Camden, N.J	2	3	3
6. Camden Coal Terminal, Camden, N.J	2	3	4
7. Conrail, Philadelphia, Pa	4	10	10
8. Chessie System, Baltimore, Md	10	12	12
9. Kentucky-Ohio Transportation, Baltimore, Md		10	10
10. Consol, Baltimore, Md		10	10
11. Pittston Co., Mapco, Inc., Elk River Resources, Old Ben Coal Co., Utah International, Soros Association (Anne Arundel County), Baltimore, Md			15
12. Cnessie System, Hampton Roads, Va	14	15	16
13. Norfolk & Western Railway, Hampton Roads, Va	32	35	35
14. Cox Property at Portsmouth to be developed either by A. T. Massey, Pittston Co,. Consol & Island Creek or the N. & W. Ry, Hampton Roads, Va		10	25
16. Ashland Oil Inc., Westmoreland Coal Co., Utah International, Inc., and Armco Inc., Hampton Roads, Va	NA	NA	NA
17. Alla-Ohio Valley Coal, Morehead City, N.C	3	6	15
18. Gulf Interstate Coal Terminals, Morehead City, N.C		10	20
19. Atlantic Resources, Inc. (American Coal Export Co.), Wilmington, N.C	2	4	8
20. Utah International, Wilmington, N.C	NA	NA	NA
21. Massey Coal Terminal, Charleston, S.C	2	4	8
22. Savannah Coal Terminal, Inc. (Harbert, Elk River & Family Lines), Savannah, Ga		5	15
23. Hutchinson Island Coal Co. (Strachan Shipping Co. & Pope Evans Robbins, Inc.), Savannah, Ga		6	12
24. Southern Minerals Corp., Savannah, Ga	4	8	13
Total, east coast: 11 port areas with 24 coal-handling facilities	84	192	282
B. GULF COAST			
1. McDuffie Terminal, Mobile, Ala	5	10	20
2. International Marine Terminals, New Orleans, La	4	9	12
3. Electro Coal Transfer Corp., New Orleans, La	10	15	20
4. River & Gulf Transportation, New Orleans, La		12	20
5. Port of New Orleans/Ryan Walsh Stevedoring, New Orleans, La	2	5	10
6. United States Steel, Baton Rouge, La		12	15
7. Louisiana Coal Services, Baton Rouge, La		5	10
8. United Energy Resources, Baton Rouge, La		8	15
9. Texas-Oklahoma Port Co., Steeltown, Tex	5	[1]5	5
10. Galveston Port Authority, Galveston, Tex. (Pelican Island bulk terminal)		10	20
Total, gulf coast: 5 port areas with 10 coal-handling facilities	26	91	147
C. WEST COAST			
1. Metropolitan Stevedore Co., Long Beach, Calif	2	5	15
2. Port of Los Angeles, Terminal Island, Los Angeles, Calif	3	12	20
3. Pacific Resources, Inc., Port of Kalama, Wash		5	15
Total, west coast: 3 port areas with 3 coal-handling facilities	5	22	50
Grand total, port capacity for U.S. coal	115	305	479

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[1] With the addition of a 2d stacker-reclaimer capacity can be increased to 10,000,000 tons per year.

PREPARED STATEMENT OF ROGER W. A. LEGASSIE

Mr. Chairman and Members of the Committee: I would like to express my appreciation to this Committee, and to Southern Illinois University, for their efforts in bringing together public and private sector officials to discuss the factors affecting international utilization of high sulful coal. It is also especially appropriate that such discussions be held in a region concerned directly with the policies and programs that will be the focus of this hearing and of the subsequent conference.

There is no question that coal must assume growing importance in the world's energy profile in the coming decade and beyond. Statements made at this hearing reinforce a uniform viewpoint that the amount of oil in international trade probably will not increase significantly from 1980 levels, especially given increasing oil demands internally in OPEC and other countries with emerging oil production potential.

On the other hand, coal has more potential than any other fuel source for providing additional energy in the 1980s. One reason is economics. Given the recent multiple increases in world oil prices, coal has become a significantly cheaper fuel than oil for utility and large industrial boilers, both domestically and internationally. To illustrate this, let us assume a world oil price of $35 per barrel and a delivered coal price of $60 per short ton. The total annualized costs for a new coal-fired baseload powerplant in Europe can be calculated at approximately 50.38 mills per kilowatt-hour—a figure which includes the costs and capacity penalty of adding pollution control equipment such as a scrubber. The costs of fuel and operations alone for an existing oil-fired powerplant would be approximately 57.50 mills per kilowatt-hour.

In other words, many countries may find it more economical to build new coal-fired powerplants than to continue operating existing oil-fired plants. This economic advantage is providing the impetus for greatly expanded world steam coal trade, and it is important to note that coal retains these benefits even after adding the cost of pollution control equipment.

Another contributing factor is, of course, the magnitude of the nation's storehouse of coal. As members of the Committee, may be aware, the Department's Energy Information Administration last month released revised official estimates of our domestic coal reserves as of January 1, 1979. The nation's coal reserves are now estimated at 475 billion tons—up eight percent from the 438 billion tons estimated in 1976. This is the coal that can be economically recovered by current mining techniques. The coal reserve beneath the U.S. are equivalent, in terms of energy content, to almost 2 trillion barrels of oil. Bituminous coal is the principal rank of coal in the reserve base, accounting for 242 billion tons, or about 51 percent of the total.[1]

In light of these factors, the contribution of U.S. coal in meeting an expanding world energy demand will continue to increase. Last year, steam coal exports jumped 90 percent over the 1979 level. Exports to Europe increased by 700 percent. The coal export forecasts for 1985 by the World Coal Study were reached last year, five years ahead of the projections. Between now and 1990, the Interagency Coal Export Task Force has projected that the U.S. portion of international trade in steam coal could increase to approximately 64 million tons per year.

Yet, as bright as coal's future appears based on these hypothetical projections, one must be cautious in drawing conclusions without first examining several factors more specifically. In particular, when estimating the potential for high-sulfur coal exports, it is important to be aware of the limitations imposed by potential steam coal buyers on undesirable emissions. Most coal importing countries generally impose some degree of controls on the level of sulfur dioxide and trioxide emissions that can be emitted by coal combustion.

Controls on sulfur emissions take many forms: limits on fuel sulfur content; limits on emissions from a single plant, or on overall nationwide emissions; and "tall stack" or other design and equipment requirements. Regulatory structures vary from country to country. In some cases, the setting of air quality standards and their enforcement are shared by local jurisdictions and the national governments; in others it is totally centralized. Some countries have created "protected zones", in which utilities and industries agree to adhere to stricter standards, either at all times or during pollution alerts.

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[1] Subbituminous coal comprises about 182 billion tons; lignite, 4 billion tons, and anthracite, 7 billion tons. About 318 billion tons of the reserve base are considered mineable by underground methods while some 156 billion tons are thought to be mineable by surface methods.

Italy, for example, limits utility coal sulfur content to 1.0 percent although exceptions have been granted for powerplants burning domestic lignite. The Netherlands has an emissions ceiling of 500,000 tons of sulfur dioxide per year from all sources. Although use of electrostatic precipitators to reduce the release of particulates is common, application of flue gas desulfurization equipment is not widespread. Only in Japan, where flue gas clean-up systems are required for nearly all powerplants, has such technology been widely applied. Consequently, European utilities are expected to seek coals that are relatively low in sulfur content, generally 1.5 percent or less. Tighter restrictions will apply in specific areas. Similar requirements are expected in the Pacific Rim.

Higher sulfur levels are generally acceptable for use in cement and lime kilns in both western Europe and the Far East. In some countries, restrictions are less stringent for industrial uses than for utilities, and higher sulfur coals can be used. The coal demand for these uses will, of course, be substantially less than for power generation.

For these reasons, estimates are that nearly half of the coal exported from the United States in the mid 1990's will most likely be bituminous coal of less than 1 percent sulfur. The rest will be almost equally divided between low-sulfur subbituminous coal and bituminous coal of greater than 1 percent sulfur.

I've attached to my formal statement a table giving the current coal specifications for sulfur for coal importing nations in Western Europe and the Far East.

EMERGING TECHNOLOGIES

While the major proportion of coal exports from the United States in the next several years is expected to be low-sulfur coal, the longer-term prospects could be enhanced by the application of new, more environmentally beneficial technologies. One such example is the fluidized bed coal combustor.

A fluidized bed combustor burns coal in a turbulent bed of hot limestone or dolomite suspended by an upward-blowing stream of air. The limestone or dolomite chemically combines with the sulfur dioxide formed during the combustion process and prevents it from exiting the boiler. No scrubber is required to burn high-sulfur coal. In the United States, fluidized bed technology on an industrial scale is approaching the commercial threshold. Several firms are moving into commercial application of the atmospheric pressure version of this advanced technology based in large part on the successful demonstration conducted at Georgetown University in Washington, D.C., and a sound technical data base developed in both private and public sectors.

Fluidized bed coal combustion has attracted similar interest internationally. In the Federal Republic of Germany, for example, fluidized bed combustion represents a significant area of development in a government budget where about half of the non-nuclear research funds is devoted to coal. Two atmospheric fluidized bed boilers—the largest with a thermal capacity of 35 megawatts—are currently being operated by Ruhrkohle in cooperation with several private firms, and a 124-megawatt plant is planned for construction in Hameln by a local utility. In the United Kingdom, the British Babcock atmospheric boiler at Renfrew has accumulated substantial operating hours, and a commercial expression of this is the retrofit installation of a fluidized bed boiler by Babcock International Combustion at the Central Ohio Psychiatric Hospital in Columbus. There are at least nine companies in the United Kingdom which are prepared to offer on a commercial basis a fluidized bed boiler or furnace. In Denmark, where 99 percent of the country's energy is imported, small-scale five-to-ten megawatt fluidized bed boilers are being studied for potential use in district heating systems. In Japan, where more than 15 million tons of coal will be used in power plants in 1990, fluidized bed technology is gaining increasing attention, and the Japanese have a five-megawatt fluidized bed pilot plant under construction. Additional coal will be imported for industrial applications.

The most widespread use of fluidized bed combustion is in the People's Republic of China, which revealed at last year's 6th International Conference on Fluidized Combustion that it had more than 2000 fluidized bed boilers in operation, some with more than 40,000 hours of accumulated experience.

Another longer-range technology area is synthetic fuels—oil and gas manufactured from coal. Here too considerable international activity has become apparent. For more than 20 years following World War II, the largest commercial synthetic fuels activity in the world centered in the Republic of South Africa which last year activated its second commercial coal-to-liquids facility. In other countries, several smaller-scale synthetic fuel systems are also operating predominantly to produce coal gas for use in manufacturing chemicals. Like the South African plants, many use technology suited for the coals found in their general region, typically low-sulfur, non-caking coals. The processes encounter considerable difficulty when applied to the high-sulfur bituminous coals found in the United States, due to the tendency of these U.S. coals to cake under the required temperatures and pressures.

More recently, the turbulent nature of the world oil situation has sparked renewed interest in the commercial development of new, more efficient synthetic fuels technologies in several countries, some without indigenous coal reserves. In many cases, U.S.-developed technology, including that which can process high-sulfur bituminous coals, is being pursued with the eventual expectation of importing U.S. coal as a primary feedstock.

The Exxon Corporation, for example, proposes to build a $350-500 million coal gasification pilot plant in the Netherlands as a precursor to commercial deployment of the technology in Europe. Several coals will be tested including U.S. high-sulfur caking coals. The Texaco coal gasification process, also suited for high-sulfur caking coals, has been licensed to the German firms of Ruhrkohle and Ruhrchemie, and they have continued development of the concept in a 150-ton per day pilot plant at Oberhausen. International Shell is developing a pressurized version of the Koppers-Totzek gasifier and is now operating a pilot plant near Hamburg, West Germany. The British Gas Corporation plans to continue development of an improved version of the first-generation Lurgi gasifier which has as one of its benefits, the capability to use midwestern and eastern U.S. coals.

Future markets for these gasifiers could be enhanced by the application of new technologies such as the M-Gasoline process. This technique is attracting increasing attention in Europe as well as in the U.S. as a way of converting methanol (which can be made from coal gas) into high-octane gasoline.

In the United States Ruhrkohle of West Germany, a Japanese consortium called Japan Coal Liquefaction Development Co., and AGIP of Italy are cosponsors of the Exxon Donor Solvent process—an advanced coal liquefaction method now at the pilot plant stage. Ruhrkohle is also participating in the H-Coal process development, another advanced coal liquefaction pilot plant.

THE FEDERAL PROGRAM

With increasing private sector interest both in the United States and many other industrialized nations, coupled with the need to restore the nation's economic vitality, the Administration has made several fundamental changes in Federal policies regarding the development of our energy resources.

Simply stated, we see the principal near-term Federal role as improving the investment climate, providing a competitive marketplace and implementing tax and regulatory reforms. Decontrol of oil prices was the first step in this direction. As oil is priced at its replacement value, coal will became an even more attractive alternative, and by improving the investment climate, industry will be encouraged to increase its R&D and capital investment spending.

In addition, we are reviewing for withdrawal more than 200 regulations issued by the Department or its predecessor agencies.

The Clean Air Act comes before Congress for review this year. In this regard, we are examining ways in which a better balance can be brought between our nation's need for energy production and our need for a safe and healthy environment. The Act, as it has been interpreted, has put the Federal government in the position of dominating decisionmaking related to industrial development and growth. This role has traditionally been exercised by the states and the private sector. We anticipate that formal Administration recommendations will be sent to the Congress by the end of this month. Recognition of the need to channel capital investments toward the environmental problems and solutions that offer the greatest payoffs will be emphasized in these recommendations.

The Surface Mining Control and Reclamation Act is also being reviewed. The Act established a complex body of laws to regulate all surface mining activities and the effects of underground mining on the surface environment. In concert with the Vice President's Task Force on Regulatory Relief, the Department of the Interior is reconsidering the regulations and intends to remove burdensome, excessive, and counterproductive requirements.

In the area of tax reform, the Administration's proposed Accelerated Cost Recovery System would stimulate plant and equipment expenditures for new coal facilities by increasing the after-tax rate of return for these investments and by increasing the firm's after-tax cash flow. The proposal provides accelerated write-off of capital costs of machinery and equipment and certain industrial and commercial buildings over a period of 10, 5, or 3 years. Coal mining equipment which is generally depreciable over an 8 to 12 year period under current law, could be written off in 5 years under this new system.

Regarding coal exports specifically, the Department of Energy was one of 14 departments and agencies which participated in the Interagency Coal Export Task Force formed in the Spring of 1980 at the direction of the past Administration. In its roughly six months of existence, the Task Force undertook a number of related activities including the assembly of existing data and the development of significant new information regarding the international coal market. In January 1981, the Task Force published an interim report for public comment. To date, more than 40 comments have been received from a broad spectrum of interested groups and individuals. Many of the comments stressed the opinion that exporting coal is primarily a private sector responsibility—that the proper role of government is to ensure that there are no Federally imposed barriers to more efficient delivery of coal to ports and waiting vessels and that the Federal permitting and review process be streamlined to prevent inordinate delay in port improvement projects.

The Administration is currently reviewing the comments prior to determining what, if any, specific Federal measures are needed as a follow-on to the draft interagency report. This activity is receiving Cabinet-level attention and we anticipate the Administration will be prepared to comment specifically on the subject of coal exports within a short time.

We have taken action recently within the Department of Energy to establish a specific function related to coal exports within the Office of Fossil Energy. Mr. Mario Cardullo, who is accompanying me today, will serve as the focal point within DOE for these activities.

Recognizing that specific comments are still forthcoming from the Administration, I have attempted to summarize some key factors impacting the U.S. position in international coal trade.

Port handling facilities are being expanded. As demand increases, market forces have provided incentive to industry to do what is necessary to promote exports. Today, much is already being done through private initiative. Expansion projects are underway or planned at some 35 ports and harbors. A result of numerous short term efforts, coal exports in March 1981 (9.6 million short tons) were almost 42 percent over February and 72.4 percent over March 1980. Continuation of this positive trend is dependent, of course, on an early resolution of the coal strike.

Existing effective loading capacity is estimated at 94 million short tons per year. Expansion underway would add more than 23 million tons by 1983 and planned expansion would increase capacity to 184 million tons. Given current projections for U.S. coal exports, port capacity should be more than adequate within a few years.

We expect that after 1990 a significant portion of coal will be transported in ships too large to call at present U.S. ports unless alternate coal loading technologies are developed and available (such as single point mooring for either slurry or coarse coal loading). Unfortunately, primarily due to the existing review, authorization, appropriation, and permitting process, past port and navigation improvements have taken 20 to 25 years from the initial study to final construction.

The Department of Energy supports efforts to speed up the review, permitting and authorizing processes associated with port projects. The administration has proposed legislation providing private sector reimbursement in the form of user fees for costs associated with port dredging. This will help port improvement projects proceed at a pace consistent with commercial demand rather than Federal budgetary constraints.

THE DOE TECHNOLOGY PROGRAM

By turning toward a free competitive marketplace and away from massive government sudsidies, private industry will be able to do what it does best—namely invest funds on those activities which improve a firm's competitive position because they are cost effective. In turn, the Federal government will focus its funding support on that longer-term, high-risk research and development which industry has generally been less willing to undertake.

A prime example of this refocused approach and its specific application in the coal area is in our environmental control technology program. Industry is making significant progress in the commercialization of advanced scrubber systems, such as the lime spray dryer. With several commercial units being marketed for low-sulfur western coal, our original fiscal year 1981 program was to accelerate the application with eastern high-sulfur coals. This plan was altered when it became evident that the momentum building in the private sector was beginning to penetrate the eastern coal industrial market and a decision was made to rely on this momentum to carry into the utility sector without major governmental assistance.

Likewise, we are concluding our development efforts for the atmospheric version of the fluidized bed combustor which, as I have indicated, is gaining increasing domestic and international commercial interest. We are now focusing our program on the next generations of the technology, including the pressurized fluidized bed as well as new concepts such as staged combustion. We are also beginning to examine new coal-based fuels, such as coal-water, coal-methanol and coal-ethanol mixtures, in view of the activity underway both domestically and overseas in commercially applying coal-oil mixture preparation and utilization technology.

In the synthetic fuels area, the Department of Energy is ending its program of major technical fossil energy demonstration and instead, will focus solely on supporting longer-range research and development. The responsibility for constructing major synthetic fuels facilities, both commercial-scale and "first-module" demonstrations, will be consolidated within the U.S. Synthetic Fuels Corporation. We believe this will provide a more efficient and focused program for demonstrating synthetic fuel production with a concomitant savings of Federal dollars.

Our coal mining and preparation program has also been refocused to emphasize long-range/high-payoff/high-risk research. No longer will we fund activities that are designed to improve a specific company's process, rather we will focus on generic and more basic R. & D. which can benefit the industry as a whole. Underground mining research is concentrating on (a) the development of basic mining technologies including strata control, seam and rock strata cutting, materials handling, automation and system control, and environmental monitoring and control; (b) the development of advanced, innovative concepts of mining underutilized reserves such as coal seams which are too thin for conventional mining systems or which lie at too steep an angle; (c) integrated coal mining/preparation concepts such as underground coal preparation.

We have not requested funding for surface mining research in our fiscal 1982 budget proposal now before the Congress. Since many of the near-term projects are initiated by private companies and since the improvements in productivity would accrue to the individual companies, industry has sufficient incentives to pursue this kind of lower risk technology development without continued Federal funding.

Coal preparation research will focus on the development of (a) a comprehensive data base on the potential for beneficiating principal U.S. coals, (b) technologies that can extract 85–95 percent of the total sulfur and ash from these coals, and (c) environmentally oriented research such as the characterization of coal preparation plant wastes for possible disposal in underground mines.

To coordinate our mining research, we have implemented Memoranda of Understanding with the two other federal agencies involved in the mining area—the Departments of Interior and Labor. With DOI's Bureau of Mines, which is charged with coal mine health and safety research, DOE reviews its coal mining production research to avoid duplication and maximize complementary research efforts. With DOL's Mine Safety and Health Administration (MSHA), which is charged with enforcement of federal coal mining health and safety regulations and approval for safety of all equipment and methods employed in U.S. mines, we review our research efforts, alert MSHA regarding needs for advanced mining system approval and solicits suggestions for improving the technology under development in our program.

To ensure that our international partners are aware of the technology under development in the United States, the Department of Energy actively participates as one of 20 countries in the International Energy Agency, including its Economic Assessment Service. This Service assesses the economic merits of existing and emerging technologies and provides nations with key data for their use in determining the commercial potential within their own economic sphere.

CONCLUDING REMARKS

An integral part our program is the conviction that we must be as concerned about the energy security of our allies overseas as we are about our own vulnerability to energy disruptions and our reliance on unreliable energy sources. We can make positive contributions in both areas by reducing our own oil imports, thereby relieving price pressures on the world market, and by becoming a major exporter of steam coal.

These are not overnight tasks, and they will not be accomplished with massive government spending and Washington-based decisionmaking, but by the private sector. Our task in government is to ensure that we do not stifle the initiative and technologic creativity that exists within our private enterprise system to use U.S. coal in the international marketplace. It is more properly our task to ensure a free and stable coal trading environment.

I will be pleased to answer any questions Members of the Committee might have.

Coal import specifications—Sulfur (maximum percent by weight)

Europe:	
Norway[1]	1.5
Sweden[2]	0.6–0.8 (maximum)
Finland[3]	
Denmark[4]	1.5 (1.0 preferred)
West Germany	1.3
Belgium/Luxembourg	2.0 (1.0 preferred)
Netherlands[5]	0.3–1.2
United Kingdom	2.0 (1.5 preferred)
Ireland	2.0 (1.0 preferred)
France	2.0 (0.4–1.5 preferred)
Italy	1.0
Spain[6]	1.8–1.8
Greece	3.0
Far East:	
Japan[7]	1.0
Taiwan	1.5 (air dried)
South Korea[8]	1.0
Hong Kong	----------------------

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[1] 1.0 probable maximum for electricity generation.

[2] From proposed environmental regulations.

[3] Finland has relied almost totally on low-sulfur Polish coal so there has been no need for restrictions.

[4] At 10,800 to 12,000 Btu/lb net or 11,300 to 12,600 Btu/lb gross.

[5] 1.8 percent can be used if blending to 1.0 percent overall is possible.

[6] 2.5 percent maximum for industrial use.

[7] 2.0 percent maximum acceptable for cement manufacturing.

[8] 1.5 percent to 3.0 percent acceptable for cement manufacturing.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY TO MR. LEGASSIE

Question 1. The Reagan Administration has come under some highly publicized criticism for some of the budget cuts it has made in every area of the energy budget, with only nuclear being saved. I should note, by the way, that I was extremely unhappy to see that money was withdrawn from the 1981 budget for the Perry County coal gasification plant, which I and other members of Congress worked very hard to sustain. DOE decided not to continue funding the Perry County plant, a decision which troubles me. That facility, if it is ever completed, would mean nearly 2,000 jobs for the people of this area. Just as important, further development of this coal gasification project would mean a great deal to the future of high-sulfur coal utilization. It is my fervent hope that this project will be continued, either through funding of the Synthetic Fuels Corporation or from private industry. How can you reassure foreign coal buyers, Illinois coal producers, and myself that the Reagan Administration's cutbacks in the area of fossil fuels do not signal a diminished commitment to this important energy resource?

Answer, First, I want to assure you that our commitment to coal remains undiminished wherever energy markets indicate that coal can be used efficiently. There is a widespread consensus that coal will provide more of our total domestic energy needs in the future than it has in the past thirty or forty years. And it's clear also that world energy security can be enhanced by greater reliance on coal.

But there are some serious economic problems blocking the path to greater coal usage. For example, many existing utility and industrial boilers were designed for oil or gas; shifting these to coal on the basis of current technology imposes additional costs, such as those connected with environmental controls, reduced boiler efficiency, transportation, storage, waste management, operations, although the fuel costs of switching to coal would be lower. Similarily, industrial energy consumers (especially involving metals, chemicals and refractories) who need large quantities of process heat, face difficult economic problems in equipment or space limitations, product effects, environmental concerns, and other site-specific concerns.

The solution to these problems differs in each instance. Specific technology improvements are required to meet various needs. For example, cost-effective liquid or gaseous fuels are needed where coal cannot be used directly; improved coal quality is required to avoid major economic penalties in the conversion of many existing boilers to coal; and more flexible combustion, power conversion, and waste management systems would greatly facilitate an overall switch from oil to coal. While incentives exist for the private sector to adopt technologies which address these problems, the Fossil Energy program is also helping meet these technological needs in each of these areas. Our emphasis is on the essential research and development. In fact, we are attempting to establish a technology foundation from which the private sector could move towards prompt commercialization when the economics are right.

In its program of economic recovery, the Reagan Administration has adopted a policy of removal and reduction of Federal activity which inhibits productive activity in the private sector and removal of unnecessary and excessive regulations; and reduction of taxes to stimulate efficient product and investment, including that related to coal production and use. The objective of this policy is to encourage industrial productivity in a free market.

Most of the reductions of activities in fossil fuels are in those areas that can best be accomplished by the private sector. This is not to imply any less of an Administration commitment to fossil fuels; rather, a recognition of what the proper Federal role should be.

Our potential foreign trading partners in the area of coal export can be further encouraged by the Administration's establishment of a "Coal Interagency Working Group", under the direction of the Secretary of Commerce, who has stated that the policy "emphasizes our commitment to greater American participation in the international coal trade, and our determination to remove government impediments to the achievement of that goal."

The Department of Energy is a key participant in that working group. The Departments of the Army, Interior, Justice, Labor, State, Transportation, and Treasury; the Offices of Management and Budget; the U.S. Trade Representative; the Environmental Protection Agency; and the Interstate Commerce Commission are also participants.

In response to your concern related to the Perry County Project, DOE certainly shares your hope that this project is continued. Accordingly, the Department is continuing to fund the design activities as part of the orderly phase-out of DOE support related to the High-Btu Demonstration Project. We hope the completion of design activities later this year will provide sufficient design data to enable the sponsors to meet Synthetic Fuels Corporation application requirements, in the event SFC support is sought; or to provide a basis for seeking private financing.

Question 2. How does the Department of Energy's current budget for research and development to increase the use of high-sulfur coal compare with Department budgets in this area from prior years?

Answer. The Administration is requesting $381 million in budget authority to carry out coal research and development programs in fiscal year 1982 including a number of programs aimed at the utilization of high-sulfur coal. This represents a reduction from the budget submitted by the previous Administration in 1981, with the major part of the reduction resulting from the restructuring of the Federal Government's synthetic fuels program. In fact, over $840 million of the reduction in the fiscal year 1982 Budget are associated with the decision to direct the major projects to the SFC. Since there is $17 billion available in the SFC, adequate funds do exist for further development of such commercial efforts.

Fossil Energy has historically had a number of very large plants in its Budget which are now being recommended for consideration by the Synthetic Fuels Corporation. If we analyze the amounts budgeted in fiscal year 1982 and in prior years for these major synthetic fuels projects, versus the technology base program, we can make a realistic comparison of what is really happening to the Coal R&D budget.

The research and development funds for Coal, after adjustment for major projects, has averaged over $400 million in prior fiscal years compared to a level of just over $300 million in the current fiscal year 1982 Budget proposal. This reduction is a reflection of fiscal stringency necessary to reduce the overall levels of Federal spending. It should not be assumed that because the Federal Government is spending less that technology development in this area will necessarily suffer. In fact, many of the problems facing the coal industry are the result of regulatory policies and most of the hope for the future can be attributed to economic factors. While the development of new technologies will provide new markets and lower costs, there is every reason to believe that private industry now recognizes these incentives and will continue to allocate more funds to new technology developments.

Question 3. What evidence do you see that private industry is filling the gap which has resulted from DOE's budget cuts in this area?

Answer. The revised FY 1982 budget submitted to the Congress must be viewed within the overall context of the new Administration's energy policy. The reduction in Federal R&D spending should be balanced by improvements in the investment climate resulting from the Administration's policies in areas such as tax and regulatory relief. Decontrol of oil prices will increase domestic exploration and discovery of new conventional petroleum resources as well as the application of improved recovery techniques; decontrol also eliminates a price disadvantage. Removal of unnecessarily cumbersome permitting and regulatory policies will unshackle a coal industry that has not yet begun to approach its full potential.

By letting private firms allocate resources among technology choices, there will be no need in the future for the Federal Government to select which projects proposed by private industry should receive Federal support. These judgments can best be made in private markets. The risk of wrong government decisions or the attempt to balance Federal support among competing firms or technologies will no longer be a problem.

A goal of the President's energy program is to remobilize technological innovation within the private sector to bring about the expanded development and production of untapped energy resources and to encourage private allocation of resources to new technologies in both the production and use of energy.

The system in which private funds are invested at risk with the potential for significant return serves this country well. It can and should be permitted to serve in the rebuilding of our energy security. We believe that the incentives for the development of the vast domestic coal resources presently exist and will continue in future years.

With the Administration's removal of price controls on petroleum and with eventual removal of natural gas price controls, the return to coal consumption are increasing. Therefore, the Federal coal technology program has been refocused to support longer term, high-risk research and development. Research and development emphasis remains in the areas that can utilize the high sulfur coals, such as direct combustion, liquefaction and gasification.

There seems to be increased industrial interest in commercialization, for instance, there were significantly large number of applications received by the U.S. Synthetic Fuels Corporation—61 firms applied initially with additional proposals received after the March 31 submission deadline—all of which propose moving into actual construction rather than continuing additional studies. The response indicates that not only has industry responded significantly, but that the proposals represent a wide diversity of technologies and locales. In addition, spending for R&D by private industry is increasing at a rate much greater than inflation. For example, the oil and gas industry spent over $2 billion in R&D in 1980, about 30% more than they spent in 1979. Companies are announcing new plans for adopting innovative technologies. In the case of atmospheric fluidized bed combustion, the private sector is making large strides in commercializing this technology. There are several vendors selling this type of combustor and there are over 30 units either in design, construction or operation which have been wholly funded by private industry. In the final analysis, economics will dictate the timing of the introduction of new technologies.

Question 4. You have told us that the Department is committing itself now to long-range/high-risk/high payoff research projects for coal cleaning (page 8 of your testimony), no projects that would not otherwise be funded privately. Please describe which projects DOE is focusing on in this area, and how the Department's current budget and manpower for these programs compare with the budget and manpower given these programs in prior years.

Answer. The coal cleaning program is directed towards coal quality objectives exceeding the state-of-the-art capability. This automatically shifts R&D emphasis to finer grinding to liberate more of the inert matter and advanced physical and chemical cleaning technologies to separate impurities, including organic sulfur, from the coal. We are also emphasizing coals of greater economic importance to five major marketing regions of the United States, so you might say that our main projects are the enhancement of regional coals to quality levels comparable to fuel oil. The economically important higher sulfur, higher ash coals of the midwestern region (such as Illinois No. 6) stand to benefit particularly through this major "coal quality" improvement effort.

Achievement of our program objectives will require more intensive efforts in fine coal physical cleaning and we are consequently directing more of our experimental work to magnetic, flotation, kinetic, and agglomerative processes. We've almost completed laboratory phase investigations on two chemical processes which, on the basis of bench scale work, promise to reduce the sulfur and ash contents of coals like Illinois No. 6 to less than 0.5 each. Our aim, of course, is to establish a firm process technology base from which the private sector could move promptly to commercialization.

Budgetary information for coal preparation is summarized below:

	Budget authority in millions
Fiscal year 1980	$10.9
Fiscal year 1981	7.0
Fiscal year 1982	6.0

The fiscal year 1980–1982 decrement reflects a shift, as mentioned earlier, from demonstration and near term activities towards essential R&D to upgrade coal quality to levels exceeding state-of-the-art capability. Federal manpower during this same interval has remained essentially stable averaging slightly over 50 man-years.

Question 5. Dr. LeGassie, one of the most important research and development projects DOE has been engaged in recently is the Grimethorpe Project, which has been sponsored by the IEA. Three nations—the United Kingdom, Germany, and the United States—have been funding since 1977 a fluidized bed demonstration project which could conceivably open up limitless markets for high-sulfur coal exports. The United States has been paying about one-third of the cost of this venture so far. Now, however, I understand that DOE is considering dropping the United States, participation in this project—it might not contribute the final $11 million which would carry this project through to fruition. I am very concerned abou the impression we may leave the international community about our commitment to fossil fuel research and development if this project is dropped. What can you tell us about Grimethorpe's status? What can you tell us, in fact, about DOE's overall commitment to international research projects to increase the exportability of high-sulfur coal?

Answer. The IEA/Grimethorpe facility is a jointly funded unit under the sponsorship of the United States, the Federal Republic of Germany and the United Kingdom. The Grimethorpe PFB plant is a flexible experimental facility which provides the means to conduct research to support PFB development. Construction is complete and the unit is presently undergoing hot commissioning with start-up of the first test series for combustion performance.

Secretary Edwards stated at the most recent meeting at the Ministerial level of the International Energy Agency that the Department of Energy will continue its participation in the Grimethorpe project. Both the House and Senate fiscal year 1982 appropriation bills include $9 million for this continued participation.

During fiscal year 1982, these funds will allow for continued experimental testing hours and provide the PFB technology base program with an enhanced reliability of test results and greater ability to optimize and characterize detailed combustion behavior; capability to test U.S. coals thereby permitting extrapolation of performance data between extreme coal types; and, data linking Grimethorpe to commercial plants (transient/load-following behavior and optimized design.)

We believe that the export of high sulfur coal will be enhanced by international projects, such as Grimethorpe, which have the purpose of developing the technology for economic and environmental acceptable methods of using this fuel.

In addition to the Grimethorpe project, there are other international coal research projects which can assist in the exportability of U.S. high sulfur coals. The 100 barrel-per-day methanol-to-gasoline project with West Germany is developing technology for production of a high octane motor fuel from which methanol is manufactured from high sulfur coal. Other technology being developed in cooperation with other countries includes the EDS and H-Coal liquefaction process. Pilot plants of the latter, built with partial funding from abroad, are located in the United States. Furthermore, the IEA's Economic Assessment Service, with support from the United States, is assessing the factors pertinent in export of U.S. coal. As will be recalled, Mr. Ray Long presented his findings on this subject at the Illinois Conference in June.

Question 6. One of DOE's two national mining technology centers—the Carbondale Mining Technology Center in Carbondale, Illinois—is chartered with exploring means of improving the productivity and the safety of surface mines. Increased mining efficiency, of course, improves the marketability of coal. I understand, however, that the CMTC is due to be effectively closed down by DOE at the end of fiscal year 1981. What is CMTC's current status, and what is DOE's justification for eliminating the CMTC from the DOE budget? What will be the impact of this cutback on mining research?

Answer. Carbondale Mining Technology Center was DOE's lead center for the development of improved surface mining technology. Carbondale personnel also monitored about half of our research contracts in the underground research area. Carbondale has no specific surface mining health and safety charter. That research area is the province of the Bureau of Mines, Department of Interior.

As a result of our recent Reduction-in-Force, the staffing of Carbondale will be reduced from the fiscal year 1981 total of 24 full time people to two full time people in fiscal year 1982. Our intent is to eliminate federal staffing the end of fiscal year 1982. We will also decide how the physical plant will be disposed of during fiscal year 1982. One option recently discussed during the fiscal year 1982 Senate Appropriations action provided for the possibility of Southern Illinois University taking over and operating the Carbondale Facility.

As you know, the Administration has been seeking every opportunity to discipline federal spending and to adopt a reasonable tax and regulatory environment which will assure that productive activity is undertaken by the private sector. The net effect has been the reduction in DOE's mining budget from $33 million in fiscal year 1981 to $15 million in fiscal year 1982 and the elimination of funding for surface mining. The incentives for private industry to continue funding development of new technology will be increased as a result of the Administration's economic policies and we expect technology development in this area to continue.

PREPARED STATEMENT OF ARTHUR F. NICHOLSON

MARKETING MECHANISM FOR HIGH SULFUR COAL

The need for additional markets for high sulfur coal does not have to be documented anew. There has been ample evidence of decreasing production and increasing unemployment in the Illinois Basin coal fields since 1977. The rate of growth of coal fired electric generating capacity east of the Mississippi River has been and will be too low to provide the needed markets. Other current domestic markets for high sulfur coal are too small to be of any consequence. On the plus side, however, the high cost of oil is causing many industrially developed countries to turn to coal as a fuel for their electric utilities.

The most prominent areas for export markets are the Pacific River countries, i.e. Japan, Korea, Taiwan, Hong Kong, and Singapore, and Western Europe. Japan, with little domestic coal resources, has been active in the development of technology to control the emissions from burning coal, and along with the other Pacific Rim countries, will be a growth market for coal. Unfortunately, the coal resources of Australia, Western United States and Western Canada are more favorably located to serve the Japanese markets than is the Illinois Basin high sulfur coal. Because of transportation networks and costs, Western Europe is a more logical market for Illinois Basin coal, and the emphasis in this paper will be concerned with mechanisms to serve that market.

It could be argued, and probably will be, that no new marketing mechanisms are needed for high sulfur coal. There are several coal-producing companies and coal brokers who are heavily involved in marketing coal to Western Europe. It is not our purpose to criticize them for lack of knowledge or lack of effort to market high sulfur coal. While there are some notable successes, clearly there are not enough successes or this hearing would not be necessary. Therefore we would like to suggest some ideas that may be useful in expanding the markets for high sulfur coal.

Except for limited specific situations, potential coal users in Western Europe are looking for low sulfur coal. As described below, the technology to burn high sulfur coal lags the U.S. experience. Being painfully aware of the slowness of U.S. electric utilities to install equipment that would permit the utilization of high sulfur coal, it is our feeling that significant growth in high sulfur coal markets in Western Europe will develop slowly without external stimulus. The external stimulus cannot simply be more sales effort. We need a different kind of sales effort, one that is long-term and that meets the competition in terms of cost, reliability, and environmental concerns.

It is our observation that the focus of the producers and brokers is necessarily short term. The pressures to produce results in the immediate future makes it difficult for them to expend significant effort to develop markets that will absorb coal only after two or three years of marketing effort.

Present West European sources

The competitors for the Western European coal market are the domestic coal resources (which range from almost nothing in Italy to substantial in England and Germany), South Africa, Poland, Australia, South America, and other miscellaneous sources. South Africa is well situated to serve a limited share of the market, but must conserve its resources for its own energy needs. The problems with relying on Poland are well known. Australia is more logically a supplier to Japan, and South America is a limited supplier. The United States is the best and most reliable source of steam coal for Western Europe. Appalachian coal is the preferred choice at the moment by several coal users in Europe quite possibly because Appalachian coals are somewhat similiar to the design coals of the existing coal-fired plants.

The implication is that if high sulfur coal is to become widely used in Western Europe a significant effort will be needed to cause the boilers to be designed to use Illinois Basin high sulfur coal. For that to happen the utility building the plant or the company installing industrial-size boilers must be convinced that the cost and reliability of using high sulfur coal is equal to or better than using other fuels.

Market price and reliability

The cost aspects of the equation in terms of market price, can be performed readily by competent and respected consultants. The problems is, as it always was, to establish valid assumptions about the nature of future costs of the different fuels. Therefore, reliability of supply becomes a highly significant factor.

Reliability of supply has even more overtones in an export market than in a domestic market where producer or transportation work stoppages are the chief concerns. In addition to these two, there are at least two other important considerations in an export market. Political stability in the exporting country and the likelihood of obtaining export permits are a significant consideration in reliability. Another is the willingness or capability of the seller to fulfill the contract when better market opportunities or unforeseen problems arise. This last consideration is especially important when small companies are involved.

Our effort in Kentucky has been to develop a synfuel market in Western Kentucky to provide a market for our high sulfur coal and to work on an export market for our Eastern Kentucky coal. East Kentucky is characterized by a large number of independent producers who individually cannot service the export market. Our initial thought was to establish a producers' cooperative that would include enough coal resources to support a long-term contract. However, a cooperative by itself is insufficient. There is still the problem of reliability of supply. A cooperative may not be strong enough to ensure that all members meet their contractual obligations. We found it necessary to establish an Authority, a non-profit public corporation, to perform certain functions in the Commonwealth's best interests. Through this mechanism we believe we can act as conduit between our independent producers and the export market.

Technology factors

At this point in the development of our export market we have urged the West European countries to plan to use high sulfur coal and have offered technical assistance through our coal laboratory. There is some polite interest, but the emphasis is still on low sulfur coal. The task will be to clearly demonstrate the economic advantages of burning high sulfur coal. We are developing the staff capability to perform that task and are honing their skills on coal vs gas and oil fuels for industrial sized plants.

In the comparison, below, of technology and cost factors of differing air pollution abatement options, it can be seen that we need considerably more effort in perfecting and making more cost-effective the options capable of making use of high-sulfur coal acceptable in Western Europe. It is imperative that we demonstrate the environmental and economic feasibility of synthetic fuels, of fluidized-bed combustion, of coal-oil mixture, etc., if we are to convince foreign buyers, whether utilities or industry, that Illinois Basin coal is a viable alternative to their present sources. This, plus the lower cost, compared to other fuels, and the reliability of the source, will make Illinois Basin coal competitive in the export market.

WESTERN EUROPEAN CONTROL STRATEGIES AND ABATEMENT OPTIONS

As noted, above, most European countries utilize low sulfur coal as a primary means of meeting air pollution control regulations. However, there are several future abatement options which offer potential for opening the European market more to higher-sulfur coal. A marketing strategy for Illinois Basin coal must have as a basis the increased demonstration of the technological feasibility and cost advantages of these options.

Present control strategies

Most of the European countries have adopted air pollution regulations. Sulfur dioxide and total suspended particulates are the two principal pollutants from coal combustion regulated in industrial countries. Ambient air quality standards or guidelines for these have been established in many countries (Table I). The standards are in some cases considerably more stringent than in the United States. The extent to which European countries have succeeded in meeting their standards has not been documented. It is generally felt that improvements have been made for sulfur dioxide.[1]

The legislative controls on sulfur emissions vary widely, as shown in Table II. Most have explicit requirements for emission limits or for the sulfur levels in the fuel. Most countries also regulate stack heights to limit ambient concentrations. No legislation has yet been enacted to control long range transport; however, limiting emissions has an indirect beneficial effect.

Future abatement options

The development of alternative methods for sulfur removal will be essential to the use of high-sulfur (3–5 percent) Illinois Basin coal in Europe. The steam coals used there now are uniformly low in sulfur; the 1975 average for 12 countries varietd between 0.7- and 1.4-percent sulfur.[2]

Due to large price increases and the continuing uncertainties of supplies, further increase in the use of low-sulfur fuel oil appears unlikely. But substantial quantities of low-sulfur coal are known to exist in major coal-producing countries. What is not clear are the political, social, and economic constraints that will determine the availability and price of low-sulfur coals in domestic and international markets. A number of abatement strategies that offer an option to the use of low-sulfur fuels are discussed below.

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[1] "The State of the Environment in OECD Member Countries", OECD, Paris, 1979.
[2] "Clean Fuel Supply", OECD, Paris, 1978.

Stack height.—Tall stacks are an effective means of reducing local concentrations of sulfur dioxide. This means of control has been widely used in England and, to a lesser extent, in other countries (e.g., France and Germany). This is an inexpensive and technically simple control measure. As no reduction in total sulfur emissions is achieved, long range transport problems will not show any comitant improvement; in fact, they may be somewhat exacerbated by taller stacks.

Flue gas desulfurization (FGD).—FGD has received much attention in the United States, particularly in regard to large coal-fired electric generating plants. Industrial application in the United States has been growing slowly. None of the European countries has made the commitment to FGD technology. In fact, in 1978 only 6 full-sized FGD installations could be counted, 3 in Germany, and 1 each in Norway, Sweden, and France.[3] The technology is still viewed as too costly and technically unproven for widespread application.

Fluidized bed combustion (FBC).—FBC technology offers the promise of efficient sulfur removal at low cost. The process does involve some environmental tradeoffs, such as increased production of solid waste. More importantly, full-sized units are only now in the planning stage and it is unlikely that commercialization will occur before the 1990's. Partially offsetting this disadvantage is the fact that FBC may be cost-effective for retrofitting existing boilers.

Synthetic fuels.—Also on the horizon are technologies for the conversion of coal to clean gaseous, liquid, and solid fuels through the processes of gasification, liquefaction, and solvent refining. Each of these technologies is under development in the United States and one, the SASOL Fischer-Tropsch indirect liquefaction process, is in commercial operation in South Africa. Small scale gasification is already being practiced in Europe and elsewhere and may provide the earliest alternative fuel for industrial use. Each of these technologies are suitable for high-sulfur Illinois Basin coals. Again, widespread application of synthetic fuel processes probably will not occur until after 1990 in the United States and even later in Europe.

Coal cleaning.—The mechanical cleaning of coal is best known as a means of reducing the ash content and increasing the heating value of run-of-mine coal. With increasing concern over sulfur dioxide, these processes are being reexamined for their sulfur removal potential. The method is effective for pyritic but not organic sulfur removal. Illinois Basin coals typically contain about 50 percent pyritic sulfur. Thus, reductions to the equivalent of 2–3 percent sulfur coal are possible, which is still high by European standards. Washed coals could be blended with low-sulfur coal to meet specific sulfur limits. Although coal washing for sulfur removal is not viewed as cost effective in England, countries like Germany and Poland have planned greatly expanded coal washing capacities.[4]

In the future, chemical coal cleaning using reagents like oxygen, chlorine, or ferric iron may allow high removal of organic and pyritic sulfur. Such processes do not appear to be near commercialization yet. The cost of chemically cleaned coal is expected to be high.

Coal-oil mixture.—High-sulfur coal may be mixed with oil to produce a low-sulfur fuel called coal-oil mixture (COM). COM can either be transported to or mixed at (or near) the site of use. Boilers can be retrofitted to burn COM, but existing oil or gas broilers will suffer some derating. The process is technically simple, but many potential problems (e.g., tube corrosion and particulate control) have yet to be evaluated.

In summary, it is our opinion that the most critical mechanism needed to market high sulfur coal is to demonstrate that high sulfur coal can be burned in accordance with environmental standards at a competitive cost and that the coal will be there when needed. We do not believe enough is being done to convince overseas markets.

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[3] R. A. Barnes, "The Long Range Transport of Air Pollution. A Review of European Experience", J. Air Polllution Control Assoc., Volume 29, pp. 1219–1235, 1979.

[4] E. S. Rubin, "Air Pollution Constraints on Increased Coal Use By Industry. An International Perspective", J. Air Pollution Control Assoc., Volume 31, pp. 349–360, 1981.

TABLE I.—AMBIENT AIR QUALITY STANDARDS FOR SO_2 AND PARTICULATES IN INDUSTRIAL COUNTRIES[a]
[All units in $\mu g/m^3$]

Group or country	Sulfur dioxide			Particulate matter		
	Annual	Daily	Other	Annual	Daily	Other
Canada	60	300	900	70		
	[b]30	[b]150	[b]450	[b]60	120	
European Community	*80	‡350	††130			
	†120	**250	‡‡180			
Finland	180	250	[d]720	180	250	[d]720
France		250			[e]350	
Germany, Federal Republic of			[f]140			[f][n]200
			[g]400			[f][n]400
Italy		260	[d][h]650		300	[k][h]750
Japan		100	[i]260		100	[i]200
Norway		200	[c]60		120	[c]40
Spain			[i]400			
	150	400	[j]256	130	300	[j]200
			[k]700			
Sweden		[e]300	[c]60			
		[f]200	[i]750		120	[c]40
United States	80	365	[l][m]1300	75	260	
				[b]60	[b]150	([m])

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[a] As of 1978.
[b] Secondary standard.
[c] 6-mo average.
[d] ½ hr average.
[e] Maximum value.
[f] Long-term average.
[g] Short-term average.
[h] Special zones.
[i] 1-hr average.
[j] 1-mo average.
[k] 2-hr average.
[l] 3-hr average.
[m] Various State standards also may apply.
[n] Also, half this value for > 10μ.
*PM>40.
†PM<40.
‡PM<150.
**PM>150.
††PM<60.
‡‡PM<60.

Source: E. S. Rubin, "Air Pollution Constraints on Increased Coal Use By Industry. An International Perspective," J. Air Pollution Control Association, vol. 31, pp. 349–360, 1981.

BEST DOCUMENT AVAILABLE

TABLE II.—LEGISLATIVE CONTROLS ON SULPHUROUS EMISSIONS IN SOME ECE COUNTRIES

	Planning	Investment decisions	"Polluter pays"	Financial incentives	Nuisance and health laws	"Alert" periods	Low S fuel			FGD option	Emission limits	Air quality criteria
							Nationwide	SPZ's	"Alerts"			
Austria							?					X
Canada											X	X
C.S.S.R.	?		?					X	X		?	
Denmark	X			X			X	X				
Finland	X				X		?				?	?
France				X		X	X	X	X			
Germany, Federal Republic of	X					X	X			X	X	
Hungary	X	X	X					X			X	X
Ireland	X						X					
Italy							X				X	X
Luxembourg							X					
Netherlands							X			X	X	
Norway	X		?				X	X		X		
Poland		X	?								X	
Sweden							X	X				
Switzerland							?					
U.S.S.R.	X		X								X	X
United Kingdom	X			X	X		X	X			X	
United States											X	X
Yugoslavia		X	X		X						X	

X—Implemented wholly or partially.
?—Implementation under consideration.

Source: R. A. Barnes, "The Long Range Transport of Air Pollution. A Review of European Experience," J. Air Pollution Control Association, vol. 29, pp. 1219–1325, 1979.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED BY SENATOR PERCY TO MR. NICHOLSON

Question 1. Your testimony focuses on the promise of exports of high-sulfur coal mixed in a slurry with oil. Can you tell us what the advantages are of a coal-oil slurry mixture, and what stage of development this process is in?

Answer. I have discussed coal-oil mixtures (COM) with officials of Italian utilities. The advantages of COM are, first, that COM can be used in some existing boilers with minimal retrofit; also COM—capable boilers are now available on the market. COM offers promise, over time, of improving the marketability of higher-sulfur coal. Depending upon the relative proportions of coal and oil, coal with sulfur content of around 2 percent can be used. If higher-sulfur coal and low-sulfur coal are blended prior to use in COM, coal having around 3.5 percent sulfur could be used. However, I must add that, in my opinion, COM cannot at present compete with direct burning of coal except in limited and unusual circumstances.

Question 2. You mention in your testimony that the State of Kentucky has concentrated on exporting its low-sulfur eastern Kentucky coal, and has planned to commercialize its western high-sulfur reserves through synthetic fuels. Have your feelings about the exportability of high-sulfur coal changed since the Carbondale coal export hearing and conference? Do you believe that high-sulfur coal has an export future?

Answer. As I stated at the conference, I know of very limited interest in high-sulfur coal by foreign buyers. However, as the foreign technology develops to consume coal, high-sulfur coal will become more attractive to importers. As I further stated at the conference, there is not enough being done to expedite the development of technology to use high sulfur coal in countries outside the U.S.

Senator PERCY. And now, beginning panel six, the international marketing of high-sulfur coal, I would like to welcome Peter Borré, Acting Assistant Secretary for International Affairs in the U.S. Department of Energy. Since January 1981, he has been responsible for the preparation of U.S. energy policy internationally. Mr. Borré has held energy policy planning positions in the Federal Government since 1974.

TESTIMONY OF PETER BORRÉ, ACTING ASSISTANT SECRETARY FOR INTERNATIONAL AFFAIRS OF THE U.S. DEPARTMENT OF ENERGY; GEORGE ECKLUND, VICE PRESIDENT, ZINDER-NERIS, INC.; JOHN FERRITER, U.S. DEPARTMENT OF STATE; ZACHARIAH ALLEN, SENIOR VICE PRESIDENT, F. R. SCHWAB & ASSOCIATES, INC.; THOMAS TRUMPY, EUROPEAN DIRECTOR OF PROJECT ASSISTANCE INTERNATIONAL; AND EDWARD J. BENTZ, JR., PRESIDENT, E. J. BENTZ & ASSOCIATES

Mr. BORRÉ. Thank you, Mr. Chairman. I am glad to be here and, incidentally, to be out of Washington briefly.

I have a prepared statement which has been delivered for the record. In the brief allotted time, I'd like to highlight some of the features of today's oil and energy markets and the consequent improvement, in our judgment, to the building of future steam coal trade. My remarks relate to the industrialized world, that is, the realm of the International Energy Agency.

You could put together today an oil market sketch roughly along the following lines: soft prices in the headlines recently, spot-market deflating, cutbacks in production, particularly among premium oil producers in north and west Africa, acrimonious OPEC meetings, analyses that show the imminence of, perhaps, a structural condition of surplus, and finally, perhaps the most telling indicator, Mr. Chairman, free maps and windshield cleaning at gasoline stations. Namely, all of the hard and fast evidence of a so-called oil market glut.

This description, Mr. Chairman, is really not applicable today, but it would reflect conditions prevalent about 3 years ago when the average OPEC price was $13. And, in fact, during the second and third quarters of 1978, the "energy" problem seemed to be over.

Today, we are confronted with some momentary signs of relief in the oil market, but today the average OPEC price is $35 per barrel, which is a virtual tripling in the price over a period of 3 years, with significant economic hardships to the United States and our principal friends and allies overseas. There is evidence that some kind of structural adjustment is beginning to take hold, particularly in the wake of the oil price explosion of 1979.

The recent oil conservation performance in the United States and in many of the other IEA countries is very real. It's not just a recessionary downturn, considering our economic growth in the first quarter of this year. In addition, no less an authority than Sheik Yamani in a recent speech seemed to be indicating some concern about the mobilization of energy supply resources in the industrial world, suggesting that at an existing price structure of some $35, his associates in OPEC may have overshot their mark.

Nonetheless, Mr. Chairman, there is a risk of complacency today, and just this morning there are indications that all is not well in the Middle East. The potential for conflict is always there. It seems to me, therefore, that we have to break the lock step relationship between oil and economic activity, and, more importantly to reduce our vulnerability to oil supply disruptions.

Many speakers have touched on the role that international trade in steam coal can play in bringing this about. I will not go through a list of the alternative energy supply sources, Mr. Chairman, but if you look at nuclear power throughout Western Europe, if you look at the near-term potential to increase oil supply under secure conditions; if you take a careful look at the gas supply that could come into Western Europe over the eighties from such countries as the Soviet Union, Algeria, and Libya, you must conclude that international steam coal throughout the eighties, and particularly the first part of the eighties, must play a significant role. This is an important role, not only in the energy mix of our principal friends and allies overseas, but also in relation to the energy security concerns that they feel so strongly about right now.

In closing, Mr. Chairman, the United States is not just another coal supplier with an abundant resource. We have a proven ability to function as a stable source of supply, and we have an open commercial system for direct foreign participation. That puts us in a position to play a leadership role this activity as it unfolds over the years to come.

I suspect that you will be increasingly drawn to the energy security aspects of world trade Mr. Chairman, perhaps back in Washington, and you will continue to work toward removing the obstacles to the development of this trade. Thank you.

Senator **Percy**. A subject of tremendous interest in which the Foreign Relations Committee is giving a great deal of attention in terms of the future.

Our next witness is Dr. George Ecklund, vice president of the Zinder-Neris, speaking on behalf of Gen. Norman Wilson-Smith, president of Zinder-Neris.

Mr. ECKLUND. These remarks presented by Zender-Neris, Inc., a consulting firm wholly dedicated to coal, are taken from the Zinder-Neris publication, "World Steam Coal Service," a definitive study of the international supply demand balance for coal, and from recent conversations with a selected group of our correspondents abroad.

The domestic markets for Illinois coal are being developed through technology to reduce the impact of the high-sulfur content. This action is necessary to make full use of a vital regional natural resource. Foreign customers, however, have full freedom of choice in making their decision, and they will buy low-sulfur coal as long as it is available at a reasonable price. High-sulfur coal, therefore, will find an overseas market only when the price spread between low- and high-sulfur coal overcomes the disadvantages of the use of high-sulfur coal. This spread currently is not sufficient to attract overseas customers. Increasing demand for the low-sulfur coals should cause their prices to rise, and this could force users to reassess their use of high-sulfur coal.

Foreign demand for Illinois Basin coal does exist, but it is limited at present, and markets must be sought assiduously. Because of restraints of the Panama Canal, the Far East market is quite restricted. The primary overseas market is in Western Europe.

In preparation for this conference, Zinder-Neris polled some of its representatives and friends in Europe, and asked the following questions, and we received answers from seven coal importing countries.

First of all, what is the acceptable limit of sulfur for utilities? In Denmark, it's 2 percent; in Italy, 1 percent, although legislation has been introduced to increase that sulfur content; in Sweden it is eight-tenths of 1 percent; in Germany, 1 percent; in Spain, 1½ percent; in France, 1 to 2 percent; and in Belgium, 2 percent.

Will utilities buy cheaper high-sulfur coal for blending? Denmark, yes, they will, but all do not have mixing capabilities; in Italy, only to a limited extent; in Germany, blending is almost unknown; in Spain, they will do it if facilities are available; and in France, they will blend if the volatility is roughly equal.

What discount is required on high-sulfur coal for blending by utilities? In Denmark, 10 percent; Italy, 2 percent for each one-tenth percent of sulfur over 1 percent; in Germany, the price discount is immaterial in view of the antipollution laws; in Spain, the discount must be sufficient to offset extra cost; and in France, it must cover all costs of blending.

What industries will take high-sulfur coal and how much? In Denmark, the cement industry, 100,000 tons annually of 2½-percent sulfur. Italy, the cement industry will take 1 million tons in 1980, 2½ million in 1985, 5 million in 1990. In Sweden, the cement industry now takes 200,000 tons and by 1985 will take 300,000 tons; the pulp industry will take a maximum of 300,000 tons. In Germany, only the cement industry will take high-sulfur coal if it is discounted about $4 per ton. Spain will take coal in the cement industry and about 30 percent of its steam requirement will be in cement. In France, the cement industry will take coal with sulfur content of 2.3 to 2.5 percent.

Finally, what are the prospects for scrubbers and fluid bed combustion units? In Denmark, it is a limited prospect; in Italy, studies are underway, but the results at present are unknown; in Sweden, they will be used, but only for coal with maximum 2 percent sulfur; in Germany, technical improvements may encourage future demand, but in the long-term, high sulfur coal will not exceed 5 percent of total coal use; in Spain, utilities will avoid the expense of scrubbers and other high cost facilities; and in France, utilities are not using scrubbers and have no plans for their use.

Work is going forward in the United States, as mentioned on flue-gas desulfurization and fluidized-bed combustion in order to develop the domestic market for high-sulfur coal. The Europeans are doing similar work, but their primary objective is to control emissions rather than to encourage use of high-sulfur coal. Nevertheless, as a result of their work, they may be able to take more high-sulfur coal in the future.

Another market is developing for high-sulfur coal, but it is not clearly defined at present. It may be the subject of a Zinder-Neris marketing study if enough interest is shown. This involves processing of fuel that would replace the heavy residual oil used in Texaco and other gasifiers. The gasifiers currently use a high sulfur resid, and in the gasification process the sulfur is removed.

Work is now underway in Germany and Sweden that may result in replacing the oil with a stablized coal/water slurry. If this process succeeds, high sulfur coal could be exported from the United States in slurry form, representing a high Btu fuel at a reasonable price with no sulfur restriction. Thank you.

Senator PERCY. Thank you very much.

Mr. Ferriter, I am going to ask you to suspend your remarks for one moment, while I make my comments in relation to the Department of State, and in relation to an emergency situation that has been created I'd like to advise all of you about. After my announcement, I may have to leave, and would ask the Chair to be taken by Congressman Paul Simon.

First of all, however, I want to announce that an important pamphlet available for the first time today, "Factors Affecting the Export of High-Sulfur Coal in the Eastern Interior Basin," was prepared for our subcommittee for these hearings by the Congressional Research Service of the Library of Congress. This pamphlet is available today to all of you.

I hope our coal buyers will remember that many of them are currently spending $10,000 or more daily in demurrage charges while waiting to receive low-sulfur coal from our Eastern ports. That money instead, could be invested in research and development for new technologies to burn Illinois coal cleanly. Coal importers, and even the American Government, itself, have gotten used to thinking about low-sulfur coal to the exclusion of any other. When people learn about Illinois basin coal and its transportation advantages, they are often impressed. What Illinois coal needs is promotion to inform the uniformed buyers. The CRS looks at these questions in great detail, and I hope all of you pick up a copy today.

Now, before I make the final announcement, I'd like to pay tribute, to a very remarkable staff, both from my own office and the staff of SIU.

I have mentioned already Bill Strauss, the Staff Director and Chief Counsel of the Energy Subcommittee. I would like to mention, particularly, Josh Levin, and I will ask that he join Bill Strauss in asking my questions to the panel.

Josh Levin is a remarkable young man. I estimate that he has devoted about 16 hours a day, 7 days a week, to these hearings for the past 2 months. It is not uncommon for Senate staff members to work these kinds of hours. I have never seen harder work for less pay and more abuse than I have seen from the so-called bureaucracy that works with me in the Senate of the United States. Many of the lawyers that work for me could go out and quadruple their salaries. Josh Levin has existed on 3 or 4 hours of sleep in preparation of today. He had a chance to get over and swim one-half a mile with me in the SIU pool this morning, and passed it up. But as I say, all of our staff members are truly devoted to their work. I want to thank one of my most devoted staff members, Howard Marks, sitting over at the table, for the work that he has done on this hearing. Duane Thompson of the Congressional Research Service, Lyle Sendlein, Michael Crow, Tim Crawford, and Chuck Pizer from SIU.

We also do have several unsung heroes Janiffer Baumann, Beth Farcht, and Barbara Granzow have been of immense help to us.

Now an announcement I feel I must make. Perhaps some of you know about it already. I would like to indicate, first of all, that I have long felt that one of the most vulnerable parts of the free world is our energy supply. Whenever we have a cutoff and a cutback, or a huge price increase, you can see the dramatic effect upon the whole economy through inflation. You can see the whole dramatic effect on the free world. Today our development assistance programs, such as the World Bank, are allowing a lot of money to just barely stand even. They are running growth efforts to a standstill. They are not increasing per capita wealth or the expectations of the people in underdeveloped countries. The very, very high cost of energy is one reason for this stagnation. We recognize ourselves, more than ever before, that our total national security in the United States and the free world depends upon energy. Our economy, defense, and energy are intricately bound together.

We have seen, for instance, the damage that can be caused through embargos. We have see chaos caused to schools and factories which are forced to close. We have seen our vulnerability to an attack upon Afghanistan, so close to vital oil supplies so precious and essential to the West's economies. I have told Chairman Brezhnev of the Soviet Union: "It makes no sense at all to me for you to be in Afghanistan. That nation poses no threat to the Soviet Union of any kind." Control of Afghanistan does, however, put the U.S.S.R. within 300 miles of something the Russians have wanted for hundreds of years, warm water ports. The Straits of Hormuz. Clark Clifford remarked last year that the cutting-off of the Straits of Hormuz would mean war. Chairman Brezhnev assured me that the U.S.S.R. would never cut off that lifeline to the West, but how good is that guarantee? We must adequately protect the gulf with a strong Navy. Its importance to the West is incalculable. Just look at the vulnerability of Japan. Seventy-five percent of all the oil that Japan imports comes right straight through the Straits of Hormuz. In the event of a total cutoff, Japan, the second most powerful economic force on Earth today, would be brought to its economic knees practically overnight. Europe, too, would be decimated. We would be severely crippled. Of our oil imports, 30 percent come through these straits.

But we must be mindful that a government's military actions and terrorism can harm other sources of energy besides oil. We should recognize that terrorism alone could take out a good deal of our hydroelectric power. Think what would happen if a couple of bombs were placed in any one of those hydroelectric plants. We must be aware of the vulnerability of our nuclear plants, and of others around the world. The potential which exists for nuclear proliferation in the world is, unfortunately, very, very great indeed.

I say all this because I feel compelled to at this time, make an announcement that has come just out of Jerusalem. I have discussed it with the Deputy Secretary of State, Justice Clark, and I will make no comment about it, at this time, other than to note its impact on energy and its illustration of what can suddenly happen by the action of one nation against another. Coal conservation, alcohol fuels, all of those measures do not have the vulnerability that nuclear powerplants do. Perhaps this is one of coal's greatest strengths.

The Israeli Government today announced that its war planes have completely destroyed an atomic reactor in Iraq. Jerusalem has said that its Air Force wiped out an atomic reactor near Baghdad yesterday, and that all Israeli plane have returned safetly to their base.

The State Department is carefully studying this matter, of course. The State Department stated a few moments ago that this is a serious development of utmost concern, and that the United States is prepared to respond to requests to monitor radiation levels.

As I say, I will not comment on this in any greater detail, other than to note the impact that something like this has on the free world's vulnerability to energy cutoffs, if we put all our eggs in one basket, and if we do not aggressively develop every single alternate source we have. Conservation is first, but coal is second, both through its direct and indirect usage. This coal conference today, again, is an extraordinary phase of our economic development, as well as our national security. I express deep gratitude to every single member of our panels that have been participating in this conference.

I will see you all at 1 o'clock with the Governor of the State of Illinois, and I am happy now to turn over the Chair to Paul Simon, so that we can hear our distinguished final witnesses. I will read your testimonies very carefully.

Representative **Simon**. Our next witness is Mr. John Ferriter, who is with the U.S. State Department.

Mr. **Ferriter**. Thank you, Mr. Chairman. Perhaps it's appropriate that my remarks come after the comments that were made by Senator Percy.

I am, of course, pleased to join you today to discuss the factors affecting the international utilization of high-sulfur coal. The administration strongly supports expanded coal exports, and is committed to a course of action to facilitate coal sales abroad. As has been pointed out earlier today, increased coal exports will contribute to our national interests in a number of ways. In particular, they enhance our national security by reducing our allies' dependence on unreliable sources of energy. It is this theme that I would like to develop in the time allotted to me, and I think one, which recent events have indicated, is of critical importance for our Nation. We and our allies have endeavored to improve our international energy security to insure that precipitous oil supply interruptions do not cause an energy emergency. We have made steady progress toward reducing these dangers, but a great deal remains to be accomplished. Most countries do not yet have sufficient strategic energy reserves to cope with the supply interruption. An interruption of even a small portion of oil imports has very serious consequences for the economies of all oil-consuming nations.

The use of coal must grow dramatically as our economies continue to shift from oil to other energy resources. Coal provides an economical alternative. But, in addition, Mr. Chairman, coal is particularly well-suited to enhance the country's energy security. Use of coal as a substitute for oil will contribute to the diversity and reduced concentration of national energy mixes, the countries from which enery resources are purchased, and the types of fuels imported. Coal's potential contribution to energy security, particularly in the case of European countries, is even more impressive if you compare it to natural gas.

Europe already imports oil from the most likely perspective suppliers of natural gas: the Soviet Union, Nigeria, Libya, and Algeria. Proposed gas imports from these countries could more than offset reduced oil purchases from these same countries. Therefore, increased European gas imports might reinforce rather than reduce European dependence on specific petroleum suppliers. This development would be of most concern with respect to potential European energy dependence on the Soviet Union. Six key European countries are currently negotiating a massive natural gas deal with the Soviet Union. If they agree upon a long-term supply relationship, the Soviet Union by 1990 could provide as much as 20 percent of Western European gas imports. If the Europeans decide to import such large amounts of Soviet gas, they will have to take precautions to insure that this commercial tie does not foster unacceptable economic or political vulnerability.

In particular, the Europeans might seek to increase their use of coal from the United States as a means to counterbalance, partially, their increased use of Soviet gas. Over the next decade, international demand for coal based on commercial and security considerations could grow significantly. There are a number of problems yet to be resolved and there has been considerable discussion of this this morning. The key issue in word is "reliability."

Mr. Chairman, the Government is committed to doing whatever it can in order to improve the atmosphere for expanded coal exports. Nonetheless, Government efforts are just a start, the task of selling U.S. coal abroad must be, and I am sure will be, taken up by the private sector so that we can meet our energy security and national interest concerns. Thank you, Mr. Chairman.

Representative SIMON. Thank you, Mr. Ferriter.

Our next witness is Mr. Zachariah Allen, senior vice president of F. R. Schwab and Associates.

Mr. ALLEN. Thank you, Mr. Chairman. I have filed a text of my testimony, which incidently, I have a corrected copy here, which I will offer for the record, and therefore, I will simply embellish or highlight my comments from the prepared text.

I think it's important to note that here in the Illinois basin in the Midwest, that you have a very important reserve of coal and, in spite of the fact that the reserve base of the United States has been written up recently as a provider gas that you referred to a few minutes ago, we can't afford to squander any, and we have got 45 billion tons of coal, which is 85 percent of the total coal in this area, which have sulfur content of greater than roughly 1.9 percent. That reserve has been dealt really a double whammy over the last few years, first by the United States when we went to a compliance coal strategy, that situation has been somewhat corrected, but it will be sometime before that correction works its way through the system. And then second, on a larger scale, most of the European countries have used a compliance coal strategy in their approach to the control of sulfur emissions. However, I'd like to point out that there are changes occurring in the thinking in Europe, we are not only exporters of coal, but we are also exporters of environmental ideas, and the tallstack philosophy being practiced in many of the European countries and the low-sulfur emissions have really not solved the problems.

There is a great deal of talk at present about issues such as acid rain which are getting more and more attention, and while the cause of acid rain and the solutions to acid rain are by no means understood yet, these concerns, I believe, are going to cause people to go toward more in the way of direct control of sulfur emissions other than simply relying on the use of low-sulfur coal. However, in the meantime, it does make it difficult to sell low-sulfur—excuse me, high-sulfur coal.

The cement industry, as we pointed out, is one place where high sulfur coal can be used, and that's a nitch that the producers in this area certainly should pursue. However, I think it's also important to note that there is work going on now, which I think has substantial promise for enabling the use of higher sulfur coals in the future. Right here in Illinois, you have the Wood River demonstration project, you have here present in the audience today, Gerald Peterson, from Allis-Chalmers, who sits on top of their research program, the Kilnkest program. This is one of many kinds of projects that I think do have great promise for the future, and I think I would ask or suggest that one place that the Government can really fill a vital role in working with industry, is in providing the proper kinds of incentives and encouragement for research and development to enable us to get the maximum benefit from these energy reserves that we have in the ground, and that we cannot afford to squander.

I think it would be a mistake to try to guess which energy technologies will be successful in the future; it is going to be a competitive race, and I think we should encourage all competition in this research and development effort. But I think it does have great promise for the future, and I would ask that the Government cooperate with industry as is appropriate in the future. Thank you.

Representative SIMON. Thank you, Mr. Allen.

Our next witness is Mr. Thomas Trumpy, the European director of Project Assistance International.

Mr. TRUMPY. Mr. Chairman, I wish to thank the people who organized the reception yesterday afternoon so we could meet with some of the other people who would speak, and I will address myself to those issues which seem most relevant after that discussion.

A. Preliminary points: In Europe the definitions are, low-sulfur coal, under 1.2 percent sulfur; midsulfur, 1.2 to 1.8 percent; high sulfur, over 2 percent sulfur. Coal over 2.8-percent sulfur is considered almost like mining sulfur; it is not yet considered coal in the general sense of the world.

B. Disadvantages of Illinois Basin coal for export: There are a lot of them; it's not easy; it's going to be like pulling TEETH. TEETH is spelled: Transport, Environment, Experience, Treasury, and Handling.

Transport: These coals are far inland, and for some exploitations there is a short season in mining and a short season in shipping.

Environment: Pollution control equipment costs versus any economics which can be obtained as to coal price or operational savings.

Experience: The Europeans do not know high-sulfur coal, particularly high volatile, high-sulfur coal.

Treasury: The cash flows on domestic sales of smaller shipments—10 days on 8,000 to 10,000 tons—are more advantageous than on many export sales, where full vessel loads have to be accumulated and payment terms can be extended, as has been the case recently in metallurgical coal.

Handling: I have submitted a note already on the handling of the high volatile coals at the user's preparation level where such coals are considered to be more dangerous, because of explosion risks, than other coals.

C. No. 1. General survey: The world wants U.S. coal, almost regardless of price, to a certain extent, perhaps 20 to 40 percent of needs. See my previous outline—Action, part A. The United States is considered a reliable supplier. Reliable in the sense that interruptions of supply are expected to be less than 6 months, which will probably be the storage period which the users will count on.

No. 2. The world expects low, low-sulfur coal. Polish, Australian, South African, most coal is well under 1 percent sulfur. This coal will probably be available in sufficient quantities until after 1985, but will then become in shorter supply.

There are limited blending capabilities and knowledge; and very limited blending facilities, despite future hopes of some countries. There is, therefore, at present, little or no motivation to buy coal above the lowest sulfur level available, even if there is desulfurization equipment available.

The limited use of desulfurization equipment is further fostered by a "bubble" or "umbrella" concept of sharing environmental limits. The process economics of desulfurization should be checked, as should the economics for cementitious use of flue gas desulfurization sludge.

No. 3. High-sulfur coal is not disadvantaged in some utilizations, such as cement kilns, special stoker or fluidized bed boilers and gasifiers. But low-sulfur coal demand depends on the U.S. port facilities available for low-sulfur exports, where we agree with the ICE Port and Transport reports. I have reviewed these questions with other experts in Europe, and they see a limited availability of increased exports through U.S. east coast ports which will give greater advantage to the U.S. gulf.

No. 4. The price advantage, if any, of U.S. high-sulfur coals and strip-mined coals will be diluted as a percentage of the total costs by the time the transport and using costs are included at the ultimate user's place of use. I ask the question; Can higher sulfur coals be cheap enough to incite users to make the capital investment for their use, be it desulfurization equipment, fluidized beds, underfed stokers and preparation?

No. 5. Knowledge of high volatile coals is quite limited except among north European users of Polish coal. Knowledge of high sulfur high volatile coals is practically nonexistent, and low fusion, high sulfur, high volatile coals is a very rare product in the world market, although much of the local production is here.

D. Recommendations: No. 1. The United States must, therefore, provide experience in the use of high sulfur, high volatile coals through research, technical assistance, and support to exports.

No. 2. The United States must provide aid in developing an export commercial infrastructure for large and smaller suppliers so that the United States not be caught as the swing supplier in an accordion of world coal purchasing where longer-term contracts will continue to be taken with South Africa and Australia, and the United States will meet needs that arise above those.

No. 3. The United States must provide, finally, the export transport infrastructure, and should consider to what extent the market, rather than the suppliers, should pay for that ultimately.

There will be a future for higher sulfur coals, but increasing slowly, in a time frame starting in the late 1980's or early 1990's with more gasification and other desulfurization equipment available in Europe. Thank you.

Representative SIMON. Thank you, Mr. Trumpy.

Our final witness for this morning session is Mr. Edward J. Bentz, Jr., the president of the E. J. Bentz and Associates Co.

Mr. BENTZ. Thank you, Mr. Chairman.

First, I'd like to thank the hospitality of the Coal Utilization Center and fine staff service of the subcommittee. I very much welcome that hospitality.

Being an anchorman on this panel, I'd like to hurry briefly to depart from my remarks and testimony, and briefly recapture two things, capture the testimony of our previous witnesses of all four panels, and to focus my brief remarks on what appears to be an agenda for action for what the Government can do today to get the markets of tomorrow.

Briefly, there appears to be existing domestic and international markets for high-sulfur coal. These include the blending opportunities, limited though they are as of today, as well as the growing markets for that coal to be used domestically and internationally for needed synfuels. The dramatic elements, the Mideast of today and yesterday, underscore those needs for liquid fuels of which coal is a dramatic source.

Second, the growing industrial conversions. Cement industries in the United States, as well as cement industries in our neighbor's and trade countries, highlight this need. We must remember that in order to develop these markets, markets piggyback on other markets, and the development of the export market must not be a separate element, but indeed a part and parcel of the development of coal, domestically and internationally, sharing the same transportation infrastructure and the same benefits. I think the comments of the panel on transportation highlight the need to develop this infrastructure. Essential to the realization of all the markets is predominantly the ability to deliver coal in a price competitive and reliable fashion. Price is the final surrogate of choice. And we can deliver coal in a price-competitive fashion, that will create the incentive for productivity gains and new technologies to come here, and in line with that, the two key determinants of price competition and supply security are; one, the development of a competitively priced, well-developed transportation infrastructure to capture the benefits, particularly in this region, and second, the removal of regulatory bottlenecks that have inhibited the production, extraction, movement, and usage of coal as coal, and coal as a feedstock for other fuels.

Briefly, in my remarks, the barriers that can be removed, the barriers that are agenda for action for the Reagan administration are zero budget items, I might add, zero budget items of first, the removal of the regulatory bottlenecks and the provisions of clearcut and timely guidance on fuels derived from coal and fuels using coal. We have an opportunity to clean our act up this summer to look into that.

Second, the development and spurring of the marketplace, developmental trade standards. Standards that have worked so well for a very successful export trade that have given buyers certainty in what they were buying. Certainty that was translated into jobs, certainty that was translated into trade, and we certainly have a historical precedent to work from.

Finally, we have to develop and maintain and enhance a strong transportation structure that can service those needs now and tomorrow, and in line with that, to develop an emergency capability that can utilize that infrastructure, which is a national heritage, in times of embargo, in times of emergency, and to get on with that structure so that we can indeed make Illinois coal, as well as U.S. coal, competitive, useful and timely in the markets. Thank you.

Representative SIMON. Thank you.

Let me add to the members of the panel, in addition to the questions I will be asking, Mr. Levin will be asking, Senator Percy has a series of questions he would like to be directed to all of you for insertion in the record.

Dr. Bentz, you talked about infrastructure, and Mr. Parks, you talked about blending. We have heard a great deal with blending this morning. Do we have in our rail or water situation, the kind of transportation facilities that we can move into blending in a major way to help high-sulfur coal?

Mr. BENTZ. I can partly; we certainly have the desire, we certainly have the capabilities. As Mr. Bruce pointed out and as Herb pointed out in the transportation panel, that in order for that infrastructure to be placed, there has to be commitment. In order for us to be competitive in the world market, our harbors and ports must be developed. I think the answer is yes, but the Government will have to lead the role in providing the commitment both in terms of removal of the regulatory bottlenecks as well as in fostering the environment where the private sector, international and domestic, invest in that infrastructure. And I think when they see the clear-cut guidance, they will invest as demonstrated in the many announcements that Herb talked about and other members spoke about, that have occurred in the last 3 months.

Representative SIMON. Mr. Parks.

Mr. PARKS. The answer is definitely yes, but more important, I think we have to first get to the commitment, the willingness to blend. We are not looking at physical restrictions so much as we are looking at the reluctance to blend, because if you do that, that means that you're taking a quantity of someone else's coal in order to blend down to a product that will be serviceable and acceptable to an export client. So there is a reluctance to do that, and that's where the restriction comes. And that's what we have to overcome.

Representative SIMON. One comment, and one other question, and I will ask Mr. Levin for any questions he may have.

Mr. LeGassie—and I am not picking on you here now—but as you know, as a member of the House Budget Committee, I had some concerns about our failure to move on coal research, concerns that affect gasification, liquefaction, but also—and the previous administration, I regret to say, had the same foot dragging in this area—and combustion in precombustion and postcombustion, if you will look at the budget for 1982, we're down in a significant way in all three, while nuclear research, we expand the budget. And I know from my conversation with Senator Percy, he shares my concerns here. I don't—if you care to comment, you may, but I think there is a growing body of concern in the House and Senate by our foot dragging in the area of research, and we have heard it—we have heard at least two members of this panel talk about the importance of research. Mr. Cope earlier talked about the importance of it, it's an area we are clearly for utilized high sulfur coal, we've got to be doing a lot more research. I don't know if you care to comment, Mr. LeGassie——

Mr. LEGASSIE. Well, certainly we are trying to reduce the load that the Government puts on the economy as a whole by looking at all budget items.

Representative SIMON. I understand that.

Mr. LEGASSIE. So, I think we're trying to be selective in what we support now and selective in what we do not support, so I certainly would say that the primary focus of the research and development programs we plan to go forward with is, first, in the area of making liquids available, because it is a liquid energy problem we have more than any other kind of problem. After that first target, the next is to expand the utilization of all kinds of coal, particularly high-sulfur coal available for use in the Midwest. We are having good success in that program, sir.

For example, the pilot plants that are now running, the Exxon Doner Solvent and the H-Coal process, which are both direct liquefaction processes, are based upon the use of Illinois/Kentucky coal. We've just gone by a major milestone there, and we are seeing Exxon put a lot of private money in a coal gasification plant in the Netherlands. This will be able to use U.S. coals as a new source of gas supply for Europe through a coal route that will not depend upon Russian gas coming across the borders.

So there are some very significant development activities that are ongoing, although we are trying to reduce levels. It is a difficult task to decide how to cut back, but maintain the most important things in place. I think we share the objective of being sure that our R. & D. program is an attractive one, and one that has its eye on the right targets. If we work together, maybe we can insure that we accomplish both objectives; that is maintaining a program at a level that we can afford, but also making sure that the program aims at those things that need to be accomplished.

Representative SIMON. I just hope you will take the message back that there is concern, that when we cut, for example, one of those three back 54 percent, I—some of us find a hard time defending those kind of reductions. Mr. Earnshaw—and anyone else who would want to comment on this—Boeing moved from a position of being in the doldrums economically, to the No. 1 export for the Nation, in large part, because of aggressive use of Export-Import Bank. We have traditionally not used the Export-Import Bank for consumable items that you can't take back. Is there any possibility that the coal industry could do what Boeing has done, and in some way, receive financial assurances from the countries that are recipients, and in that way, increase coal exports significantly?

Mr. EARNSHAW. Congressman, I really can't answer that one specifically. I get asked repeatedly as I go around the country about Ex-Im financing, per se. It strikes me—and this is a generalization for a specific question—that while things have been going on and while our export rivels have been moving along in the new administration, the Ex-Im Bank really has been in a process of change, it's really only now that Bill Draper and Charlie Ward and Luke Ward are beginning to come to grips with the problems of the Ex-Im Bank.

I personally believe that objectives of the bank, the funding of the bank, what it's there to do, need to be reviewed. I think the objectives that it has pursued very successfully historically may not be the same objectives it needs to pursue in the future, both in terms of the impact on our export activities, we must export more, we all know that, and specifically the targets to which funding has gone. And I should think that in the area, not only of coal exports, but perhaps in the area of services rather than goods, the policies of Ex-Im need to be reviewed to be sure that its activities are focused on the needs of the 1980's and not the needs of the 1960's. It is a general answer, but I hear what you're saying, and I personally will take the thought back with me.

Representative SIMON. If you could, and I have noticed that in checking with other countries, in part, some of their patterns develop because they initially started procuring from one country, Egypt is an example, it goes back to the era when the Soviet Union was dominent there, and they set up requirements for coal that only Polish coal meets. Well, we could just as well be in that situation, and it seems to me that the Export-Import Bank might be one of the tools.

Any of the rest of you wish to comment on that aspect?

Mr. Levin?

Mr. LEVIN. Thank you, Congressman Simon. I am very honored to join you on behalf of my employer, Senator Percy. I only have a few minutes, and I won't extend beyond the scheduled 12:30 adjournment time.

One question I'd like to ask Mr. Ferriter. Your statement today, sir, addresses the Pacific Rim and Europe. We haven't had an opportunity yet to discuss the Third World, and in particular Africa. Do Third World nations have environmental standards which might preclude the immediate direct use of high-sulfur coal? Do they have hopes for burning more coal in the future? I wonder whether Mr. Ferriter could describe briefly whether markets do exist for high-sulfur coal in Africa or South America, which might offer more promise in the short-term than the areas we've explored today.

Mr. FERRITER. You're right. I don't think a great deal of consideration has been given to the development of markets for coal in developing countries. However, I would doubt that in the short-term that you will find that there is much in the way of a market in those countries. Most developing countries do not have the facilities necessary to utilize coal. They are, in Africa, for example, heavily engaged in development of hydroelectric potential; they use oil-fired electrical generation as well. Coal is something which just has not yet entered into their energy equation. It is, however, something which we should look into carefully, because it could well be that in the medium to long-term considerable development of coal exports to the Third World might be developed. As the Congressman has pointed out, he who gets there first tends to have a potential lock on the market because of the configuration of the coal market. Thank you.

[The prepared statements of Messrs. Borré, Wilson-Smith, Ferriter, Allen, Trumpy (with attachments), and Bentz follow. Responses to written questions submitted to Messrs. Borré, Ferriter, and Trumpy also follow:]

PREPARED STATEMENT OF PETER BORRÉ

Mr. Chairman and Members of the Subcommittee: I appreciate the opportunity to appear before you today to review the increasing importance of coal in international trade and to participate in the High-Sulfur Coal Export Hearing. Detailed comments on the technology of high-sulfur coal utilization in the international market will be addressed by a number of experts, including Mr. Roger LeGassie of the Department of Energy. I would like first to review briefly the current and prospective world energy outlook and the role of steam coal in meeting our increasing energy requirements.

Oil has been the crucial energy source for the industrial countries. However, the future of international oil supply is uncertain. For a number of political and economic reasons, future OPEC oil production is unlikely ever again to exceed the 1980 high point of 29 MMB/D. It could drop below current production of 26 MMB/D. But even if OPEC production were not to decline, exports would be reduced as OPEC countries will likely increase their domestic consumption. Although production will increase in some non-OPEC developing countries, such as Mexico and Egypt, this production is likely to be offset by an increased demand for oil in those and other developing countries.

The implications of this outlook for the world price of oil over the next decade will depend, of course, upon a few key factors, including: the rate of economic growth; the continuation of the gains in energy efficiency and conservation stimulated by the sharp increases of the price of oil; the pace of development of alternate sources of energy supply; and the future prospects for supply disruptions. The real price of oil conceivably could remain stable, or, it could continue its upward trend, as economies recover and additional conservation becomes more costly to achieve. If supply disruptions occur, the price of oil could increase sharply.

Oil importing countries will remain highly vulnerable to oil supply disruptions. We have already experienced a number of oil disruptions since 1973 including:

The 1973–74 Arab oil embargo of the United States and the Netherlands which reduced world supplies by about 400 million barrels during the period from November 1973 to March 1974;

The 1979 revolution in Iran which reduced supplies in the world oil market some 250 million barrels in the period from January to March 1979 and helped increase oil prices by over 100 percent in one year (from $13–$14/barrel on January 1, 1979, to a level of $28/barrel on January 1, 1980); and

The 1980 Iran/Iraq war which reduced oil supplies available to the world by about 200 million barrels in the fourth quarter of last year.

The costs to the world economy, in terms of increased unemployment, additional inflation, and lowered economic growth were substantial.

There were also significant international political costs such as the increased leverage of oil exporting countries. For these reasons the Administration has undertaken to deal with the potential jeopardy to our energy security, our national security and our foreign policy interests through development of contingency response plans aimed at improving the ability of the United States and our allies and friends to deal with significant disruptions, and also aimed at reducing our vulnerability in the future. Our policies will rely on market forces to clear disruptions, rather than utilizing restrictions such as allocation and price controls, which have proven counterproductive in the past. We will also work closely with our allies and friends to assure that collective actions by oil consumers will reinforce, rather than work against, one another.

Although reducing our vulnerability to supply disruptions is our first priority, we recognize that in the longer term lowering the dependence of the U.S. and its allies on oil imports, particularly from insecure areas of the world, is also important to our national security and economic well-being. Therefore, this Administration is also taking steps to increase our domestic energy production and to improve our energy efficiency.

Again, we will rely on the market, rather than government programs. Government policy will be to provide the appropriate market environment through the decontrol of oil and the lowering of regulatory barriers to the increased production, transportation, and use of domestic energy sources. The outlook is positive. One reason is our extensive coal resources, another is the creative and competitive nature of the U.S. coal industry.

Coal is our most abundant energy resource. It is estimated that we have a resource base of nearly 4 trillion tons of coal, of which 475 billion tons are economically recoverable, using existing technology; this reserve base is amply sufficient to supply America's existing needs for hundreds of years.

COAL EXPORTS AND ENERGY SECURITY

Even if we could reduce substantially our reliance upon imported oil, we must be concerned about the energy security of our allies and friends overseas, including their vulnerability to disruptions and their dependence upon unreliable energy supplies. The United States can make two contributions to assist our allies' energy security:

By reducing oil imports, the United States as the world's largest oil importer makes a positive contribution to reducing price pressures on the world oil market; and

By expanding exports of steam coal, the United States contributes to our allies' efforts to reduce their continuing high levels of oil import dependency and vulnerability.

RECENT WORLD DEMAND FOR STEAM COAL

In contrast to oil, which may be supply-constrained, the world's coal reserves and resource base have the potential to satisfy a large and rapidly growing demand. Coal probably has more potential than any other resource for providing additional energy, until the transition to renewable energy evolves. Every indicator points to a significant increase in domestic and international coal demand, both in the short and long term. In fact, the surge in U.S. exports that was forecasted by the 1980 World Coal Study to begin in 1985 has already begun. The World Coal Study projected that by 1985 the United States would be exporting 20–30 million tons of steam coal. We reached this level last year by exporting nearly 27 million tons of steam coal, 16 million tons to countries outside North America and about 11 million tons to Canada. Exports of metallurgical coal in 1980 amounted to 63 million tons. Total steam coal exports unexpectedly jumped 90 percent over the 1979 level; exports to Europe alone increased by 700 percent. This surge was caused by several factors:

Polish coal production declined and exports fell by 25 percent;

An Australian strike disrupted that country's exports; and

Countries and companies overseas moved to increase their supplies of non-oil energy, as new electric power and industrial coal-burning facilities became operational.

While Australian exports have recovered, the prospects for building up substantially Polish coal exports may not be particularly promising, in the short term at least.

We all are aware of the impact that the surge in demand in 1980 had on U.S. coal export facilities, causing delays and increasing purchasers' costs. We should not let these problems, which can be corrected through the interplay of market forces, obscure the longer term prospects.

U.S. SHARE OF THE WORLD STEAM COAL MARKET

As the world demand for coal increases, United States exporters will participate significantly in world steam coal trade for the remainder of the century and beyond.

Europe presents the greatest opportunity for U.S. coal exports for near- to mid-term. It is the largest and most diversified market, with significant growth expected in coal-fired electric power facilities and industrial plants. There has been a recent growth of demand for higher sulfur coal in the cement industry in a number of West European countries, and this may be expected to increase. Although there will be significant competition from other sources such as South Africa, American exporters could account for 30 to 50 percent of the European steam coal import market during the next decade.

In the Pacific Rim, U.S. firms could obtain a lesser share of the steam coal trade, as countries such as Japan, Korea, and Taiwan increase their energy security by diversifying supply sources. The recent surge in demand for steam coal has included the cement industry in Japan, where higher sulfur coal can be effectively utilized. Although Australia and South Africa are geographically better positioned, it is expected that the United States will increase exports to this region.

COAL EXPORTERS

While the outlook for increased world coal use is potentially bright, I would like to caution that hypothetical projections do not guarantee that U.S. coal exporters will in fact obtain a substantial portion of the future market. Resolving the existing port capacity constraints, better utilization of our inland waterways system, and upgrading and building new rail transportation links, particularly in the West, will help put the United States in a more competitive position.

Poland, South Africa, Canada, and Australia are the main countries in a position to compete effectively for the world coal market. All have some elements of commercial advantage, as well as special circumstances which could affect their ability to compete on commercial terms.

Unlike the United States, which in 1980 exported about 11 percent of its total coal production, Australia exports more than half of its current output. Australian coal has traditionally dominated the Pacific Rim market, and has also made important recent inroads in the European market. However, recent labor difficulties, mounting bunker fuel costs in colliers, and distance may diminish the competitiveness of Australian coal in Europe. Overall, however, Australia has the potential to be a formidable competitor in international steam coal trade, particularly in the Pacific.

Poland enjoys a significant transportation advantage for the European market. However, Poland's recent internal problems have reduced exports significantly, and could have an impact on future trade.

South Africa represents a significant element of competition for U.S. firms exporting to Europe and the Pacific Rim, given that country's large resource base and competitive prices.

With significant reserves of coal, Canada is also a potential strong competitor in international steam coal trade. Because the majority of these reserves are located in the western provinces, the most obvious market for Canada's steam coal is the Pacific Rim countries, which are expected to account for a significant share of Canada's steam coal exports in the 1990's. While Europe is also a potential customer, high transportation costs from Canada's West Coast could limit the European trade.

Over the longer-run, we could also expect some additional competition from Colombia, the Soviet Union, and China, if there countries develop their resource potential.

ACTION TO FACILITATE COAL EXPORT TRADE

Our domestic coal industry will have the responsibility for increasing U.S. steam coal exports. The Government's role is to contribute by maintaining a stable international framework under which commercial business transactions can develop smoothly. The U.S. Government has acted to establish and strengthen that framework by strongly supporting the concept that increased steam coal use and trade are necessary to meet future world energy demand, in both the short and long term. We have supported this position with our trading partners both in the International Energy Agency (IEA) and in the course of the annual Economic Summits.

In 1979, the IEA Agreement on Principles for Action on Coal was developed to stimulate coal production, use, and trade. In May 1979, the United States was instrumental in creating the IEA Coal Industry Advisory Board. The Board is composed of senior level industrial officials, who advise member governments on steps needed to facilitate steam coal use and trade.

In addition, we have invited many of our allies and friends in Europe and Asia to visit the United States for discussions on expanded coal trade. In the past year the National Coal Association and the U.S. Government have hosted official coal delegations from France, Spain, the Republic of Korea, Italy, the Netherlands, Austria, and Denmark; there have also been numerous other visits from foreign organizations involved in coal trade. These visits have not only provided a useful forum for the exchange of information, but have also resulted in commercial contracts to export U.S. coal. We believe that these statements and actions provide a sufficient and secure basis under which commercial transactions can proceed.

ACTION BY U.S. INDUSTRY AND FOREIGN PURCHASERS

During bilateral and multilateral meetings dealing with coal exports we have emphasized that the responsibility for increasing coal trade should not rest solely or even principally within the producing countries; rather, this responsibility should in fact be shared equitably with the importing countries. It is in the interest of foreign coal purchasers to sign long-term contracts to ensure the large capital investment required to develop new mines, improve rail and barge transportation, and expand or construct new export facilities. Prospective coal-importing countries could also encourage direct investment in upstream production facilities, and act to remove barriers to increased transportation and use of steam coal within their jurisdictions.

We are confident that American business will respond to the challenge as we in government are committed to maintaining a free and stable coal trading environment.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO MR. BORRÉ BY SENATOR PERCY

Question 1. In your testimony, you state that certain geographic and infrastructural advantages give Australia, South Africa, and Canada the edge over the United States in coal exports to certain countries at present. Could you describe these advantages in a little more detail? Do foreign coal customers expect these countries to maintain their current levels of exports? Does the United States?

Answer. South Africa and Australia are our principal competitors in the world steam coal market. On average both countries have lower mining costs as well as lower ocean transportation charges. With respect to the European market, South Africa has a significant advantage over all its principal competitors, excluding Poland; the United States is slightly more competitive than Canada or Australia. South Africa's principal advantage is its lower mining costs.

Regarding the Japanese market, Australia and South Africa are nearly equally competitive, while U.S. steam coal is significantly more expensive than these two competitors' but equal to Canadian prices.

With respect to future export levels, all three countries project significant increases in steam coal exports. Our most recent mid-range projections indicate that U.S. net steam coal exports will increase from 25 million tons in 1980 to about 75 million tons in 1990 and 180 million tons by 2000.

Question 2. While the American coal industry is just now beginning to improve the infrastructure which is needed to export coal in large amounts, abundant supplies of natural gas from the Soviet Union, Libya, and Algeria are flowing, or will soon flow, to several Western nations. Which countries does DOE expect will purchase this natural gas?

Answer. Many of the European nations having natural gas networks are importing or plan to import African LNG and Soviet pipeline natural gas. West European nations imported approximately 1.1 trillion cubic feet of natural gas from these sources during 1980. In response to the phasing out of Dutch gas and rising internal demand, these nations expect to increase imports from these sources to 3–4 trillion cubic feet by 1990.

The United States is indeed concerned about the need of its allies to balance their economic interest in obtaining additional Soviet gas against the potential import vulnerabilities posed by these supplies. We have communicated these concerns to our allies and are planning to work with them in order to enhance their energy security.

Question 3. How does the United States use the International Energy Agency as a forum to articulate its interest in seeing increased Western utilization of coal, especially American coal? What can the U.S. do to increase the IEA's attention to this issue?

Answer. The IEA has been intensely interested in expanding the use of coal, particularly steam coal, as a primary means to reduce dependence on insecure sources of energy. It has served as an important forum to increase the awareness of the member countries that coal is an abundant, secure and competitive energy resource for the generation of electricity and for large scale industrial users. In addition to increasing general awareness, the IEA has accomplished the following:

In 1978, the IEA published "Steam Coal Prospects to the Year 2000." This study was one of the first comprehensive examinations of the prospects for increased steam coal use;

In 1979, the IEA countries adopted "Principles For Action" on the expansion of production, trade and use of steam coal; and

The IEA Coal Industry Advisory Board (CIAB), composed of senior officers in coal related industries, was created to formulate recommendations for implementing the 19 "Principles For Action." The Board submitted to IEA Ministers in December 1980 specific recommendations on measures needed to increase coal use. It now plans to create a coal information system and set up a working group on environmental issues and will submit in the near future recommendations on the means to increase coal use in the industrial sector.

In addition IEA Ministers, at the June 15, 1981, meeting, reiterated the need for stronger actions to realize the full potential for expansion of coal production and use. Ministers also called for a full review of member countries' coal policies and programs in 1981.

The U.S. Government, and my office in particular, was highly instrumental in developing these IEA actions on steam coal. Within a free market context, and consistent with the Administration's belief that coal can play an important role in reducing the industrialized countries' dependence on insecure sources of energy, we intend to continue our efforts in the IEA.

Question 4. What role can your office play in identifying new potential foreign customers for American coal, and helping the Department of Commerce, and other federal and state agencies, and American coal producers cultivate new markets for American coal?

Answer. In addition to the IEA related activities, my office has been regularly involved in promoting the increased use of U.S. steam coal as an important means to reduce the vulnerability of allied and friendly nations to insecure sources of energy.

We have hosted official coal delegations from France, Spain, the Republic of Korea, Italy, the Netherlands, Austria, and Denmark for discussions on expanded coal trade. We also take the opportunity during meetings with high level foreign energy officials to promote interest in U.S. coal. For example, Secretary Edwards and I raised this matter during discussions with our Moroccan counterparts in June. We plan to do so as well in talks with the Spanish Energy Minister during his visit to Washington this fall. I discussed coal exports with Jamaican officials in July and an invitation to them to send a coal delegation to the U.S. has been issued.

Question 5. Mr. Borré, one of the most important research and development projects DOE has been engaged in recently is the Grimethorpe Project, which has been sponsored by the IEA. Three nations—the United Kingdom, Germany, and the United States—have been funding since 1977 a fluidized bed demonstration project which could conceivably open up limitless markets for high-sulfur coal exports. The United States has been paying about one third of the cost of this venture so far. Now, however, I understand that DOE is considering dropping the United States' participation in this project—It might not contribute the final $11 million which would carry this project through to fruition. I am very concerned about the impression we may leave the international community about our commitment to fossil fuel research and development if this project is dropped. What can you tell us about Grimethorpe's status? What can you tell us, in fact, about DOE's overall commitment to international research projects to increase the exportability of high-sulfur coal?

Answer. After reviewing this matter in some detail and discussing it with senior British and German officials, Secretary Edwards decided to continue DOE's participation in the Grimesthorpe project and so informed our partners in mid-June. Funding for fiscal year 1982 has been provided by the Congress. Construction of the 80 thermal megawatt fluidized bed combustion plant is complete and the facility is currently well into its "hot" start-up phase.

Grimethorpe is the most significant international DOE program which would enhance the exportability of high-sulfur coal. The other major international project which could benefit the high-sulfur coal market is the U.S.–FRG pilot plant project to convert methanol to gasoline using a process developed by Mobil Oil Company. DOE is contributing one-third (approximately $10 million) to the cost of this plant which is being built in Wessling, Germany. Our domestic R&D program also includes work on coal preparation, a portion of which involves development of processes for removal of inorganic sulfur.

Question 6. What effect, if any, do you expect Israel's recent strike at Iraq's unfinished nuclear reactor to have on worldwide interest in coal?

Answer. World interest for increasing steam coal production, consumption and trade is already quite high, particularly among the major industrialized oil consuming countries. I have no reason to believe that the Israeli bombing of the Iraqi nuclear facility will influence this interest one way or another.

PREPARED STATEMENT OF NORMAN G. WILSON-SMITH, PRESIDENT, ZINDER-NERIS, INC.

These remarks presented by Zinder-Neris, Inc., a consulting firm wholly dedicated to coal, are taken from the Zinder-Neris publication, "World Steam Coal Service," a definitive study of the international supply/demand balance for coal, updated quarterly, and from recent conversations with a selected group of our correspondents abroad.

The environmental and operating disadvantages of high sulfur coal do not need repetition here. Generally, high sulfur coal is unattractive to most users and is only taken under special circumstances: (a) where the Btu value is high and sulfur is within acceptable limits, or (b) where the sulfur can be absorbed in the consumption process such as the cement industry, or (c) where the coal can be obtained at a discount for blending with low sulfur coal.

The domestic markets for Illinois coal are being developed through technology to reduce the impact of the high sulfur content. This action is necessary to make full use of a vital regional natural resource. Foreign customers, however, have full freedom of choice in making their decisions, and they will buy low sulfur coal as long as it is available at a reasonable price. High sulfur coal, therefore, will find an overseas market only when the price spread between low and high sulfur coal overcomes the disadvantages of using high sulfur coal. This spread currently is not sufficient to attract overseas customers. Increasing demand for the low sulfur coals should cause their prices to rise, and this could force users to reassess their use of high sulfur coal.

Foreign demand for Illinois basin coal does exist, but it is limited at present and markets must be sought assiduously. Because of restraints of the Panama Canal, the Far East market is quite restricted. The primary overseas market is in Western Europe.

In preparation for this conference, Zinder-Neris polled some of its representatives and friends in Europe and asked the following questions:

1. What is the absolute limit of sulfur which your utilities and industry will use?
2. Are they prepared to buy some cheaper high sulfur coal to blend with low sulfur coals exported from elsewhere?
3. What kind of price discounts would be needed to encourage this?
4. What users such as cement plants or industry do you have who can take higher sulfur coals? What percentage (rough estimate only) of your total imports would this represent? Do you expect this figure to increase or decrease in the future?
5. What are your views on the development and growth of scrubbers or fluid bed combustion units or other methods of burning high sulfur coal cleanly?

The replies to these questions are summarized in the attached table.

Work is going forward in the U.S., as mentioned, on flue gas desulfurization and fluidized bed combustion in order to develop a domestic market for high sulfur coal. The Europeans are doing similar work, but their primary objective is to control emissions rather than to encourage use of high sulfur coal. Nevertheless, as a result of their work, they may be able to take more high sulfur coal in the future.

Another market is developing for high sulfur coal, but it is not clearly defined at present. (It is the subject of a separately-contracted study by Zinder-Neris.) This involves processing a fuel that would replace the heavy residual oil used in Texaco and other gassifiers. The gassifiers currently use a high sulfur resid, and in the gassification process the sulfur is removed. Work is now underway in Germany and Sweden that may result in replacing the oil with a stabilized coal/water slurry. If this process succeeds, high sulfur coal could be exported from the United States in slurry form, representing a high Btu fuel at a reasonable price with no sulfur restriction.

PROSPECTS FOR USE OF HIGH SULFUR COAL IN WESTERN EUROPE[1]

	Denmark	Italy	Sweden	Germany	Spain	France	Belgium
What is the acceptable limit of sulfur for utilities?	2 percent	1 percent	0.8 percent	1 percent utilities; 1.5 to 2 percent for industry.	1.5 percent	1 percent; 2 percent if very high Btu.	2 percent.
Will utilities buy cheaper high sulfur coal for blending?	Yes; but not all have mixing capabilities.	To a limited extent	Not available	Almost unknown in Germany.	Many will if facilities available.	Yes, if volatility is roughly equal.	Not available.
What discount is required on high sulfur coal for blending by utilities?	10 percent	2 percent for each 0.1 percent of sulfur over 1 percent.	Not available	Price discount immaterial in view of anti-pollution laws.	Sufficient to offset extra cost.	Must cover all costs of blending.	Not available.
What industries will take high sulfur coal? How much?	Cement: 100,000 tons annually of 2.5 percent sulfur.	Cement: 1 million 1980; 2.5 million 1985; 5 million 1990.	Cement: 200,000 tons now, 300,000 tons 1985. Pulp: 300,000 tons maximum.	Only cement, but estimated discount $4 per ton required.	Cement: 30 percent of steam requirement.	Cement: 2.3 to 2.5 percent sulfur.	Not available.
What are prospects for scrubbers, fluid bed units, etc.?	Limited	Studies underway, results unknown.	Will be used but only for coal with maximum 2 percent sulfur.	Technical improvements may encourage future demand, but in long term, high sulfur coal will not exceed 5 percent of total coal use.	Utilities will avoid expense of scrubbers and other high cost facilities.	Utilities are not using scrubbers and have no plans for their use.	Not available.

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[1] Response by Zinder-Neris correspondents in Western Europe, May 1981.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO DR. ECKLUND BY SENATOR PERCY

Question 1. Might Europe's growing concern over acid rain lead in time to new legislation requiring standardized scrubbing of steam coal? What would be the effect such a requirement would have on high-sulfur coal utilization?

Answer. The countries in Northern Europe, especially Sweden and Norway, have been affected most by acid rain, resulting from sulfur emissions caused by burning coal in the United Kingdom and Western Europe. There is pressure in Europe for tightening of environmental regulations. Part of this pressure is focused through organizations such as the EEC and IEA, who hear complaints from many sources. In Europe there are few new power plants under construction and, therefore, little opportunity to install scrubbers. By contrast, Japan has many new plants underway or planned and is installing scrubbers during construction. Therefore, new legislation in Europe to lower the permissible sulfur emissions will generally require the use of lower sulfur coal.

Power plants in Europe are relatively small and there is considerable coal use in industry. Consequently, the Europeans are more likely to use new combustion methods such as fluidized beds rather than scrubbers to remove sulfur. At the same time, Europe is making more progress than the United States toward the application of fluidized beds. In summary, it is inevitable that the new legislation in Europe will require the reduction of sulfur emissions, but it is highly unlikely that this legislation will mandate standardized scrubbing.

Question 2. What are the possibilities and the problems with exporting Illinois Basin high-sulfur coal with "blends" from the West or the Eastern states? What about the possibility of blending Illinois Basin coal with anthracite reserves of Pennsylvania? What incentives might be devised to initiate either alternative?

Answer. It is possible to blend Illinois basin coal with lower sulfur coal from the Applications or the West and thus reduce the overall sulfur content. However, the sulfur content of most Appalachian and Western coals is only slightly below the present permissible sulfur level in Europe of 1 percent to 1.3 percent. Therefore, the amount of Illinois Basin coal that could be used in blending would be relatively small. Furthermore, the blending of coal from two different areas to alleviate the sulfur problem may give rise to other difficulties, such as combustion problems due to lowered ash-fusion temperatures. Characteristics of the coal other than sulfur, therefore, must be taken into account. It is possible that beneficiation of both coals could be necessary in order to achieve quality control. Extensive testing will be necessary to obtain the proper characteristics for a blended coal. Blending of coal for export sale would almost certainly have to be done in the United States rather than in Europe. This would involve transporting the coal from different mines to a third location, probably a port, where blending facilities would have to be provided. The beneficiation and additional handling of the coal would add to its cost.

Incentives for blending for export must come from U.S. initiatives, but the detailed studies have not yet been made that should precede a commercially successful blending operation. These would include technical studies, cost analysis, and market projections. Perhaps Southern Illinois University could use its facilities to analyze a dozen or more combinations of different coals in order to identify the best blends. Designation of several economical blending sites and estimates of the cost of blending would be essential; equally important would be an assessment of the foreign markets for the blended coal—tasks that Zinder-Neris is fully equipped to undertake. These studies must be closely coordinated to achieve the maximum usefulness from them.

Question 3. Your testimony describes ongoing work in Germany and Sweden to replace residual oil with a stabilized coal/water slurry. Could you elaborate on these activities, and postulate on the likely effect such initiatives will have on the direct utilization of high-sulfur coals, especially on the foreign utilization of Illinois Basin coals?

Answer. The remarks regarding work to replace residual oil with a stabilized coal/water slurry refer to some advanced work in Germany and Sweden that is just now reaching the pilot stage. Some elementary work has also been done in the United States on feeding a coal liquid into a gassifier. However, the longer-term prospects for this process may be promising for Illinois basin coal. The coal would be beneficiated to remove ash, then mixed with water and chemicals to form a stable slurry. It could then be moved by liquid transportation facilities for transshipment to a port and delivered to tankers. The slurry could be fed directly into gassifiers as a replacement for fuel oil. Coal of any sulfur content could be used in this process, because the sulfur is easily and economically removed from the gas.

At present this is not a commercially viable method of using Illinois basin coal. Additional work that needs to be done includes (1) testing to determine the most appropriate slurry composition for gassifiers, (2) developing low-cost modifications to gassifiers to accept the slurry, and (3) taking a complete census of gassifiers in Europe and Japan to determine the scope of the export market.

Zinder-Neris has an active proposal with a large U.S. energy company to obtain much of the needed information, but work on the project has been deferred until the company acquires coal properties. It is possible that our work could be combined with efforts that might be undertaken by Southern Illinois University or the State of Illinois to explore this development as a future market for Illinois basin coal.

Question 4. In the chart which accompanies your testimony, you reveal that "many" Spanish utilities will utilize high-sulfur/low-sulfur blends where facilities exist to do so. You also reveal that some French utilities will consider high and low sulfur blends if the volatility of the coals is roughly equal. Where are these utilities located? What do your findings suggests for the short-term prospects for Illinois Basin coal exports?

Answer: Spanish utilities will accept a somewhat higher sulfur coal, up to 1.5 percent. They have referred to the possibility of blending the coal themselves, but there is no indication they have actually done so as yet. The price spread between low and high sulfur coal must increase in order to provide an economic incentive for both the Spanish and the French to begin blending coal on a large scale. The names and locations of utilities in France can be provided by ATIC in New York or Paris and in Spain by CARBOEX based in Madrid.

We believe the short-term prospects for exporting Illinois basin coal to Europe are very limited. Exports will be confined to specialized sales, such as the recent sale to a Spanish cement firm, or similar instances such as the conversion of a chemical plant to coal where the sulfur can be removed for use. However, the long-term prospects for Illinois coal in the European market are considerably brighter if the new applications now emerging are pursued assiduously.

PREPARED STATEMENT OF JOHN P. FERRITER

MR. CHAIRMAN: I am pleased to join you today to discuss the factors affecting the international utilization of high sulfur coal. You have assembled in Carbondale some of the world's leading experts on coal use and trade. I am confident that the deliberations of this conference will help to identify new export opportunities and strategies for American coal producers.

As you know, the Administration strongly supports expanded coal exports, and is committed to a course of action to facilitate coal sales abroad. We are convinced that increased coal exports will contribute to our national interest in a number of ways. First, they bolster our economy by strengthening our balance of payments and expanding employment in key regions of the nation. Second, they contribute to our energy goals by reducing world competition for petroleum. Third, they enhance our national security by reducing our allies' dependence on unreliable sources of energy. It is this third attribute of expanded coal exports that relates most directly to the prospects for "emergency utilization" and that I will address today.

Since the oil crisis of 1973–74, we and our allies have endeavored to improve our energy security. Through coordinated national and international efforts, we have sought to ensure that precipitous oil supply interruptions would not cause an "energy emergency". Broadly stated, our immediate goals have been:

(1) To diversify our energy mix;

(2) To reduce our dependence on imported oil; and

(3) To develop alternative sources of energy which could be tapped in a crisis.

We have made steady progress toward these objectives, but a great deal remains to be accomplished. The 21 industrialized member-countries of the International Energy Agency still depend on oil for almost 60 percent of their energy needs. This dependence is not expected to fall below 50 percent till after 1990. Furthermore, IEA Members import 55 percent of their total oil consumption. Most countries do not yet have sufficient strategic energy reserves to cope with a supply interruption. As events of the past several years have demonstrated, interruptions of even a small portion of oil imports can have very serious consequences for the economies of all oil consuming nations.

We believe, and our allies concur, that use of coal must grow dramatically as our economies continue to shift from oil to other energy resources. First, coal provides an economical alternative. In recent years, the prices of oil and natural gas have risen so rapidly that those fuels now cost two to three times as much as coal for an equivalent amount of energy. Even mined underground, transported long distances over land and sea, and burned in plants fully equipped for environmental protection, coal is, and is generally expected to remain, substantially cheaper than oil on a dollar-per-BTU-generated basis.

Second, and more directly relevant to our discussion, coal is particularly well-suited to enhance a country's energy security. IEA countries have all committed themselves to diversification of the fuels upon which they depend. Use of coal as a substitute for oil in industrial furnaces and power plants will contribute to the diversity and reduced concentration of: national energy mixes; the countries from which energy resources are purchased; and the types of fuels imported. Supplies of coal from secure sources will be plentiful for the foreseeable future. Furthermore, oil and gas-fueled furnaces can be built with a dual-fire capability, so that coal can be substituted for other fuels without significant capital investment or shut-down time.

Coal's potential contribution to energy security, particularly in the case of European countries, is even more impressive if we compare it to natural gas, the other most readily available substitute for oil. Europe already imports oil from the most likely prospective suppliers of natural gas, the Soviet Union, Nigeria, Libya and Algeria. Proposed gas imports from these countries could more than offset reduced oil purchases from these same countries. Therefore, increased European gas imports might reinforce, rather than reduce European dependence on specific petroleum suppliers.

This development would be of most concern with respect to potential European energy dependence on the Soviet Union. Six key European countries, West Germany, France, Italy, Belgium, Austria, and the Netherlands are currently negotiating a massive natural gas deal with the Soviet Union. If they agree upon a long-term supply relationship and decide to build the proposed Western Siberia to Western Europe Pipeline, by 1990, the Soviet Union could provide as much as 20 percent of all Western European gas imports. This would represent 5 percent of their total energy consumption. In individual countries, dependence could run even higher. In West Germany, for example, Soviet gas could represent up to 30 percent of total gas consumption. Such significant dependence on Soviet energy supplies might have serious political ramifications.

It is clear that if the Europeans decide to import large amounts of Soviet gas, they will have to take precautions to ensure that this commercial tie does not foster unacceptable economic or political vulnerability. In particular, Europeans might seek to increase their use of coal from the United States as a means to counterbalance partially their increased use of Soviet gas.

The energy security considerations for coal use in Japan and less developed countries are not as significant. The Japanese already purchase oil and gas from a diverse pool of suppliers, and the Soviet Union is not looking to export large amounts of petroleum to Japan or nonaligned countries. Yet in these cases, the economic motivations for increased coal consumption still hold.

It appears then, that over the next decade, international demand for coal, based on commercial and security considerations, could grow significantly. Conversely, expanded U.S. coal exports could make a great contribution to our Nation's economic welfare and national security.

There are nonetheless some issues remaining to be resolved, which will in large part determine the distribution of market shares of the expanded international coal trade. The key issue on both the demand and supply sides, is captured in a word—reliability.

Foreign consumers are currently reluctant to enter into long-term contracts. Bottle necks caused by insufficient coal infrastructures presently limit U.S. exports. In the last year, political unrest in Poland and miners' strikes in Australia and the United States cut international coal shipments. Prospective buyers will be unwilling to make a long-term commitment to a particular supplier unless they are confident that they will be able to take delivery of coal on a timely and economical basis.

Of course coal producers face a related problem of reliability. The coal industries may not increase their production capacity and upgrade the export infrastructure as quickly as possible until they receive assurances of long-term demand, that would justify the requisite investments.

This type of chicken-and-egg problem based on reliability which could threaten expanded coal trade and its commercial and security contributions is apparently not retarding U.S. coal development and sales. The Government has taken some steps to alleviate these problems. At the 1979 Tokyo Economic Summit, western leaders pledged not to interrupt coal exports under long-term contracts, unless required to do so by a national emergency. At Venice in 1980, the leaders announced their agreement to encourage coal producers and consumers to agree to long-term contracts. We currently are seeking our allies' official sanction of foreign investment for the improvement of the U.S. coal export infrastructure.

U.S. leaders have assured foreigners that coal export contracts are enforceable in U.S. courts and pointed out that our country has never restricted coal exports, even during strikes that reduced domestic supplies. Furthermore, the Administration has already indicated its intention to minimize, consistent with national interests, the regulatory burden on coal and associated industries.

We are also trying to increase the use of coal in the developing world. Many developing countries have little experience with coal as a fuel and do not have the technical infrastructure necessary for coal use. Over the past several years, the U.S. Government, the World Bank, and others have offered technical assistance for coal-related projects in developing countries. Under the auspices of the AID Trade and Development Program, coal related projects are underway in a number of countries.

Nonetheless, the Government efforts are just a start. The task of selling U.S. coal abroad, must be taken by the private sector. I am pleased to note that industry is already rising to that challenge. Private companies are acting in all of the areas we might identify as helpful: Expanding port and inland transportation infrastructure; expanding coal production; financing both of the above; seeking to lower costs; seeking to enhance reliability in fulfillment of contract provisions (timing of delivery, prices, quality specifications, avoidance of disruptions in the flow of coal supplies, etc.); and increasing responsiveness to purchase requirements of foreign markets and buyers.

There are plans to expand port facilities so that they will be large enough to handle projected coal shipments by 1985.

In our view, actions in all of the above areas should be governed by normal considerations of profitability and should therefore be left in the private domain. The U.S. Government will not subsidize coal exports, nor will it interpose itself in any other way directly in coal trade.

However, in light of the energy security issues related to coal trade, the Government has an important role to play. We are, therefore, providing support to U.S. coal producers by emphasizing to our foreign interlocutors, both bilaterally and in the IEA, the need for them to provide assurances (e.g. through agreement to long-term coal purchase contracts or investment in U.S. coal production and transportation projects) of their long-term demand for U.S. coal. We believe that such assurances will encourage further expansion of the export infrastructure. Expansion of the infrastructure in turn is likely to stimulate further foreign interest in demand for coal.

In sum, Mr. Chairman, we believe that the commercial demand and strategic importance of U.S. coal exports will expand during the current decade. The Executive branch will continue to work with foreign buyers and governments to foster demand for U.S. coal and to enhance the reputation of the United States as a reliable and competitive coal supplies. At the same time, we will continue to depend on our strong American tradition of reliance on the private sector for the conduct of coal trade.

Thank you.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO MR. FERRITER BY SENATOR PERCY

Question 1. Your testimony graphically illustrates the reliance which most IEA member nations continue to have on imported petroleum, as well as the reliance which many IEA nations may soon develop for available, but equally unstable, supplies of natural gas from the Soviet Union. What is the U.S. government doing—and what more can it do—to mobilize the other members of the IEA to turn toward energy reserves from Western sources, such as American coal, whenever possible?

Answer. Our work in this crucial area necessarily consists of a labor of persuasion. We lose no opportunity to point out to our fellow IEA members that coal is the least risky of all importable energy raw materials. After the 1973 OPEC oil embargo, the U.S. government became concerned about the security of energy supplies both for ourselves and our allies; that was one of the prime reasons for the creation of the IEA, and it is one of the reasons we continue to participate as actively as we can in the work of that organization.

At our urging, the IEA adopted the Principles for Coal Policy, which states, "All IEA countries will enlarge their use of coal; where insufficient coal is available domestically, countries will seek long-term secure supplies of imported coal * * *." In particular, we persuaded other high-cost coal-producing countries such as the United Kingdom and Germany to commit themselves in that document to accept imported coal rather than oil to meet demand in excess of their domestic coal production.

Furthermore, again at our urging, the IEA has established procedures for an in-depth assessment of its members' coal policies. The first round of this ongoing process will take place this fall, and we plan to use the occasion to highlight once again coal's unique security advantages. Finally, in bilateral discussions and in the individual country policy reviews which the IEA's Standing Group on Long-Term Cooperation conducts each year, we emphasize to specific countries where we believe their overall energy policy could benefit from a hard-headed look at the advantages of coal in a supply emergency.

Our efforts both inside the IEA and in bilateral discussions to promote coal are assisted greatly by the economic advantage enjoyed by coal vis-a-vis imported oil, and by the evidence of instability in the oil market which the events of the last decade have so clearly provided. It is obvious to all of us that dependence on imported energy sources to fuel Western economies is a situation fraught with risk. Our role in mobilizing IEA governments to turn toward energy reserves from Western sources consists of pointing out over and over again the hazards inherent in unstable energy supplies, and the determination of the United States, for our part, to be a reliable and secure source of energy for the Western world. We make these points in multilateral as well as bilateral meetings with foreign energy officials, and also in private encounters of the highest levels of government, so that no one is in doubt about where we stand on this crucial question.

With regard to the specific question of Soviet gas, at the Economic Summit meeting in Ottawa this summer President Reagan made clear to his counterparts our deep concern about the security implications of the proposed Siberian pipeline. Our European friends and allies have agreed to consult with us on projected natural gas supply and demand balances as well as on prospective energy alternatives. Increased imports of U.S. coal potentially could provide an important energy alternative for Europe.

There are also concrete measures which can be taken to increase confidence in U.S. energy supplies, and this Administration is taking them. A Coal Interagency Working Group has been set up to monitor U.S. coal export policy, to examine regulatory restraints affecting coal exports and, where possible, to relax them, and to examine measures which can be taken to ensure timely and efficient development of U.S. coal exporting infrastructures. With regard to infrastructures, the Administration has already made one key proposal which will make development of port facilities much more responsive to market trends. The port user fee proposal (S. 809) will remove the process of deepening and improving U.S. ports from the annual Congressional appropriations process, and allow local authorities to develop such facilities in a timely manner.

Steps such as this one help us convince our IEA partners that the United States is ready and willing to increase its coal exports in response to signals they provide in the marketplace. As I noted in my testimony, we have encouraged foreign consuming firms to help assure the reliability of their coal supplies by signing long-term contracts and/or investing in American coal production and transportation facilities, and thus providing the correct signals.

Question 2. Your testimony mentions the actions of Western leaders in 1980 to encourage coal producers and consumers to agree to long-term contracts. You also describe current efforts to obtain our allies' participation in improvement of the U.S. coal export infrastructure. Can you describe both initiatives in a little more detail?

Answer. The groundwork for the Venice declaration, which I mentioned in my testimony, was laid by the IEA in 1979, when it adopted a set of Principles for Coal Policy. At that time, the IEA's member states agreed on a number of basic policy lines in order to maximize substitution of coal for more expensive and more insecure oil supplies. Some of those principles were:

"IEA countries both as producers and consumers will facilitate the expansion of international trade in coal and will do so on a basis which encourages the development of stable relations between consumers and producers, on fair, reasonable and competitive terms, especially by means of long term contracts * * *."

"Once a long-term contract for international trade in coal has come into force, the governments of IEA countries concerned will not interfere with the implementation of the contract in accordance with its terms, unless they are compelled to do so by severe developments in the coal supply situation occurring in an individual country which threatens that country's wellbeing; or by a severe international energy supply emergency in which latter case they will apply any restrictions on an equitable and non-discriminatory basis."

"In their efforts to establish an investment climate which encourages the investment necessary to expand coal production, IEA countries will in general maintain positive attitude towards investment for coal projects, including international investment flows * * *"

As part of the energy discussions at the Venice Summit, the seven heads of government who were present made a mutual commitment to greatly increase coal production and use. Their final communique stated "we will encourage long-term commitments by coal producers and consumers."

Similarly, the IEA Coal Industry Advisory Board—through which representatives of coal-producing, consuming or handling firms participate in the IEA—issued its initial recommendations to government and industry, and the first recomendation to indstry was that: "suppliers, transporters and users of coal explore and enter into, as appropriate to the specific situation, long-term relationships such as long-term contracts, joint ventures, etc., around which decisions concerning investments in the mining, movement and use of coal can be easily made."

We in the United States government have encouraged our coal producers to sign long-term contracts with coal consumers. Consistent with the IEA Principles for Coal Policy, this Administration declared in its Coal Export Policy Statement that it would not interrupt coal trade under contractual commitments unless forced to do so by a severe national emergency.

Governments of coal importing states in the IEA have also encouraged their firms to sign long-term contracts with producers, and a number of such deals have already been concluded with firms from nations such as Italy and Taiwan. We expect more to be finalized in the coming months.

Similarly, the Administration's Coal Export Policy Statement noted that "foreign coal buyers have indicated some willingness to participate financially in developing and exporting America's coal." In the Statement, the Administration declared that it welcomed such foreign participation, consistent with State and Federal law, since it would "benefit both parties, allowing buyers security against economic fluctuations while freeing American capital for other purposes."

We are aware that governments of some coal importing states have already urged their firms to invest in U.S. coal infrastructures; a number of feasibility studies and negotiations are under way at the present time. We believe that such foreign participation can provide highly beneficial infusions of capital to U.S. coal exporting industries.

Question 3. What direct contacts has your office had with potential foreign coal buyers to enhance their confidence in U.S. coal export reliability?

Answer. My office has had a number of opportunities, in conjunction with the Departments of Commerce and Energy, to brief officials of coal consuming nations during a series of visits to Washington by coal delegations from countries such as Italy, Spain, Korea, Austria. Denmark and the Netherlands, and from the Commission of the European Community. During these visits, we have stressed not only the availability of huge coal reserves in the United States, but the political will of our government to make this country a reliable supplier. As I noted earlier, we reinforce the latter point by emphasizing U.S. coal policy to the most senior officials of foreign governments in bilateral meetings and in the IEA.

Day-to-day contacts with actual or potential purchasing firms are, of course, handled by the Foreign Commercial Service (FCS) through our embassies overseas. Within each embassy in countries where substantial coal sales might be made, a coal officer has been named by FCS; we have provided them with full information on U.S. coal policy, and in particular, have asked them to bring to the attention of coal buyers the Administration's recent coal export policy statement.

Question 4. What opportunity does the United States have to direct the International Energy Agency towards a more detailed examination of coal's role as an emergency fuel worldwide?

Answer. We see coal as having a number of applications as an energy security tool. Most importantly, as I noted in my testimony, coal can contribute to reducing the heavy dependence of IEA nations on insecure and expensive hydrocarbons from the Middle East and the Soviet Union. Since economical use of coal in this kind of substitution will require long-term flows of coal to energy-importing countries, it is not an emergency question per se. Nevertheless, substitution of coal for other imported energy sources over the medium-to-long term can have a very favorable impact on energy security, and we have given such substitution particular emphasis in the IEA's work.

In a short-term, emergency situation, coal can be used in several ways to lessen the impact of interruption of the supply of another energy source. As a first step, industrial consumers and electric generating facilities which are equipped with dual-fired boilers can shift from burning other fuels to coal. (If necessary, environmental standards which might be blocking coal-fired operations of such units could be waived.) Then—assuming other demand restraint measures have reduced the total demand for energy in the system or that adequate excess capacity exists—coal-based electrical power can be substituted for power which would have been generated in oil- or gas-fired facilities through load management devices such as power-sharing and "wheeling" of power supplies from one area to another.

In order for any of these possibilities to become reliable, however, plans must be made well in advance. In the most obvious instance, boilers must be fitted with dual-firing apparatus. Coal-handling infrastructure must be available, and stocks must be built up. Electric demand management plans must be made; cooperative agreements between national utility systems must be established and concrete contingency plans must be made. In some cases, separate national electric grids must be physically inter-connected where no connection currently exists. All of this requires detailed advance planning and investment.

We have repeatedly stressed the necessity for contingency planning by IEA nations. We have urged that national contingency planning be made a subject for review in the annual policy evaluations which the IEA performs on each of its members, and we will be pursuing this issue in consultations this fall. We have also stressed the need for the group as a whole to examine the problems of fuel substitution, and to look at ways in which national governments can encourage the needed flexibility in their energy consumption.

Question 5. You mention that, under the auspices of AID, coal utilization projects are underway in several developing countries. Can you describe these programs in detail? Can you provide us with a list of ongoing AID coal-utilization projects, and describe the most significant in some detail?

Answer. Coal-related projects are proceeding under a variety of programs sponsored by AID, the Trade and Development Program, and the Department of Energy. These programs cover the entire spectrum of coal issues, as coal has become a cornerstone of U.S. energy policy. Since this emphasis on coal is relatively new, most of the projects are still being negotiated with foreign governments or awaiting various approvals on one side or another. With the proviso that information on any given project must be regarded as tentative if it is not yet signed and approved, I will mention those which are nearest completion.

India.—Under the Science and Technology Subcommission of the United States-Indian Joint Commission, a program of joint technical cooperation in the coal sector is being formulated. That program will involve a three-year exchange of expertise between U.S. and Indian scientists and technicians. The Indians want to explore U.S. technologies in the whole range of coal-utilization questions. Particular emphasis is expected to fall on fluidized bed combustion technologies and land use policies, including methods of land restoration after open-pit mining. For our part, we hope to benefit from Indian work in the fields of fluidized bed combustion, burning of coal slurries, and coal carbonization (a technology for preparation of a smokeless household fuel from coal). An agreement to finalize this program is currently awaiting signature by the Indian government.

Costa Rica.—At the request of the Costa Rican government, AID has sponsored a preliminary investigation by scientists from the U.S. Geological Survey of what coal resources might be available in Costa Rica. The field work for this project has been completed, and a report is being prepared.

ASEAN.—An agreement for technical training of personnel from the five member states of the Association of Sotheast Asian Nations is currently being negotiated. The training, which would take place at the Argonne National Laboratory, would be tailored to the individual interests of each member state, and would probably include topics in the areas of coal mining, coal importation and transportation, and environmental aspects of coal handling and use. The agreement covering this program should be signed in the near future.

Worldwide.—AID's Conventional Energy Technical Assistance Program is currently designing a one-week coal workshop to be offered around the world. This technically-oriented workshop would be designed to reach working-level technicians and engineers in the developing countries, and would give them an introduction to some of the practical aspects of converting to coal use in a less-developed country. AID hopes to be able to offer this workshop for the first time during the first half of 1982.

The Trade and Development Program also has embarked on an extensive program of coal-related projects. A list of projects which were in progress during fiscal years 1980 and 1981 follows:

BRAZIL

a. Coal development workshop

The purpose of the workshop was to demonstrate U.S. technological capabilities as they relate to the development potential of coal in Brazil. The workshop, held in April 1980, covered coal mining, gasification, fluidized bed combustion, liquefaction, and reclamation. It resulted in TDP-funded feasibility studies for a coal gasification system which are now underway.

b. Southern cone energy network

The purpose of this project was to determine the economic feasibility of an integrated natural gas pipeline and coal gasification system for the southern states of Brazil. The natural gas would be imported from Argentina and Bolivia. Methane from coal gasification would be mixed with the natural gas. The study also examines possible addition of an LNG importing terminal and regasification facilities.

c. Coal utilization study

The purpose of this project is to conduct feasibility studies in medium-BTU coal gasification, and the conversion of oil-fired utilities to use coal in atmospheric fluidized-bed combustion facilities.

JAMAICA—COAL CONVERSION

TDP has agreed to fund a feasibility study for conversion of electrical and steam generating plants of the state-owned electric utility company, private aluminum refineries, and cement company from their present reliance on petroleum to the use of coal as a basic fuel.

PANAMA—COAL TRANSSHIPMENT FACILITY

This project is a grant agreement between the United States Government and the Government of the Republic of Panama.

The grant will be used to finance the cost of professional and technical services performed by a U.S. firm to provide sufficient data, projections, and analysis to support preliminary conclusions on the economic feasibility of a coal transshipment facility in Panama. Such a facility might be used in the future to move U.S. coal from East and Gulf Coast ports to markets in the Pacific.

BOTSWANA—COAL EXPLOITATION

The purpose of this project is to provide expert assistance to the Government of Botswana in reviewing its coal resources to determine export possibilities and the potential for employment generation by development of coal-based industries (e.g. chemicals). The final report of the study has not yet been issued.

THAILAND

a. Coal-fired powerplant

The purpose of this project is to review and assess Thai plans for converting oil-fired generating plants to coal-fired plants and for installation of coal and lignite-fired power generating stations.

b. Ao Phai coal-fired powerplant

The purpose of this project is to develop the conceptual design of the coal-fired plant of Ao-Phai in sufficient detail to permit proper coordination between the coal storage and transshipment facility which will be designed and constructed first and the coal-fired generating plant which will be designed later.

Finally, AID has conducted a number of individual country energy assessments in cooperation with several LDC governments. These studies look at the entire range of energy issues, and consider what policy options an individual nation can choose to deal with its own problems and needs. An examination of coal options is a part of each country assessment. Assessments have been completed for Indonesia and the Dominican Republic, and are currently under way in cooperation with the governments of Tunisia, Kenya and Sudan.

Question 6. What are your long-range projections for the ability of the Third World to increase its utilization of coal in the coming decades? Is it expected that the Third World will impose stringent environmental standards on coal use?

Answer. We expect Third World coal utilization to grow sharply in coming decades, given coal's cost advantage over oil and the relatively wide distribution of coal resources, which are found in about 50 LDCs. Until now, those resources have been utilized in only a handful of Third World nations (only India, Korea, Turkey, Mexico, Brazil, Colombia, Taiwan and Zimbabwe produce more than 1 million tons of coal annually), but the World Coal study forecast that LDC coal use could rise from 123 million tons of coal equivalent (mtce) in 1978 to 600–900 mtce at the end of the century.

Predictions over such a long range are necessarily highly speculative, particularly in a field as susceptible to rapid change as that of energy resources. The World Bank, however, has done a study based on a detailed analysis of LDC consumption trends, economics of oil use in LDCs, and available resources, which concluded that over the next decade, LDC coal consumption will rise to 354 mtce, of which all but 32 mtce will be indigenously mined.

Given the high capital costs associated with the mining, transport and utilization of coal in the developing countries, and these countries present financial straits, the rate of increase of coal use which is ultimately achieved will be directly affected by the availability and cost of investment capital.

My office recently prepared a study on this subject entitled "Coal in the Third World: Prospects for Production, Use and Imports from the United States." I am submitting a copy of that study for the committee's information.

The treatment of environmental questions will obviously vary greatly from one Third World country to another; each nation will make its own decisions based on the perceived costs of environmental regulation and the perceived benefits it produces. In general, however, Third World nations have in the past perceived fewer benefits for their underdeveloped economies in such regulation, and so have not opted for standards as stringent as those in the industrialized nations.

Coal in the Third World: Prospects for Production, Use, and Imports from the United States

Table of Contents

		Page
	Summary	i
I.	Introduction	1
II.	Definitions	1
III.	Current Coal Use in Developing Countries	2
IV.	Prospects for Coal Use in Developing Countries	3
	A. Attraction of Coal Relative to Other Fuels	6
	B. Potential for Converting Existing Plant and Equipment from Oil to Coal	8
V.	Prospects for Coal Production in Developing Countries	9
VI.	Prospects for Imports of Coal by Developing Countries	10
VII.	Competitiveness of the United States as a Coal Exporter	14
VIII.	Evaluation of the Desirability of a U.S. Development Assistance Program Based on Subsidization of Coal Exports	17
IX.	Existing Coal-Related World Bank and U.S. Government Energy Development Assistance Programs	19
X.	Options for Promoting LDC Use of Coal through the U.S. Energy Development Assistance Program	21

Tables:

1. LDC Production, Trade, and Consumption of Primary Energy, and Installed Electricity Generation Capacity

2. Electricity Production in Developing Countries

3. Developing Countries: Commercial Energy Used to Produce Electricity 1980-1990

4. Indicative Steam Coal Costs and Prices

5. IEA Cost Estimates for Electricity Generation in New Baseload Nuclear, Oil, and Coal-Fired Power Stations

6. Coal Production Prospects of Developing Countries

7. Potential for OIDC Imports of U.S. Coal for Electricity Generation by 2000

8. U.S. Exports of Steam Coal

9. Current and Desirable World Bank Energy Lending Programs

10. World Bank Electric Power Lending

By - William N. Witting
International Energy Policy
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December 1980

Summary

In the past, coal use has been very limited in developing countries except for India (and China, which we have omitted from this study). As recently as 1978, oil-importing developing countries (OIDCs) probably consumed less than 10 million tons (MT) of thermal coal (India excluded). This was primarily because of the ready availability of relatively inexpensive oil, and coal's reputation for being cumbersome and dirty. Now that most countries are seeking to reduce their dependence on imported oil, this situation is changing, although coal remains among the least popular of alternative fuels. The World Bank projects that LDC coal/lignite consumption for electricity generation will increase by over 150% by 1990.

Coal currently costs, and according to most experts, will continue to cost much less than oil on a dollar per BTU basis, and, in most cases, somewhat less than oil when capital costs are factored in. However, expert energy projections suffer from large margins of error these days, especially when looking at time periods as long as the life of a power plant. This leads decision-makers to deemphasize price in favor of non-price factors, such as reliability of supply and balance of payments effects, in evaluating alternative energy options. In such evaluations, the attraction of coal varies from country to country.

There is very limited potential for economically viable conversion of existing power plants from oil to coal. It often takes ten years to plan and build a new power plant. Hence, decisions taken today to increase coal use will usually not be felt in the coal market for close to a decade.

Reserves of coal in LDCs are large and fairly widespread. In the past, few LDCs have taken much interest in exploiting those reserves but, stimulated by the World Bank, more are now beginning to do so. The World Bank projects LDC production could reach 400 metric tons by 1990 (210 MT excluding India), but only if continued apathy in prospective producers regarding coal can be overcome.

Probably less than 20 LDCs could be convinced to import U.S. coal. These are primarily countries which have no indigenous energy resources to substitute for imported oil. There are seven rapidly-industrializing LDCs (e.g., Korea, Taiwan) who could expand coal imports as high as 149-179 MT by 2000. Beyond these, there are about ten small, poorer LDCs, primarily in the Caribbean and Central America who might economically substitute coal imports for oil imports. Even wholesale conversion to coal by the latter would probably not generate a demand of more than about 10 MT by 2000.

U.S. coal is not very price competitive in the world market. Nevertheless, the United States is the world's largest coal exporter. We attribute this primarily to the relative reliability of the United States as a supplier, to the desire of major coal buyers to diversify widely their sources of supply, and perhaps to a perception that the United States will be more price competitive in the future.

There is limited scope for U.S. Government intervention to promote coal exports to LDCs. Subsidization of coal exports now would not accelerate the speed at which LDCs turn to coal because such decisions do not hinge predominantly on the current price of alternative fuels. Subsidization might help to increase the U.S. share of existing LDC coal markets, but it would have to be at a rate of at least 10-20% to overcome the price advantage of competitive suppliers.

The primary deterrents to increased use of coal by LDCs are their lack of familiarity with it, the difficulty of handling it, and the relatively high capital costs associated with it. We can most effectively respond to these problems in two ways. First, we can educate and train LDC policy-makers, both by improving the U.S. country energy assessments effort, and by increasing funding university training in energy-related fields for students from LDCs. Second, we can assist LDC coal use projects by supporting World Bank and other Multilateral Development Bank funding for such projects, and by providing bilateral technical assistance and financing feasibility studies.

I. Introduction

Interest in coal as a substitute for oil is burgeoning around the world. Studies of the future of coal project dramatic increases in its use through the remainder of the century. However, most of these studies have focused on the potential for increase in countries already using coal. Less attention has been paid to the countries who do not presently use it.

With oil prices continuing to ratchet upwards, a turn to coal might well benefit some countries, especially developing ones. The purpose of this paper is to examine this thesis (Sections II-IV); to ascertain whether there is significant prospect for importation of coal by developing countries (Sections V-VI); to explore whether this prospect would be enhanced by U.S. subsidization of its coal exports to developing countries through a P.L. 480 or Commodity Credit Corporation-type program (Sections VII-VIII); and finally to examine briefly existing energy development assistance programs (Section IX), and to offer some suggestions as to how the U.S. bilateral energy development program might be improved in ways which would indirectly promote U.S. coal exports to developing countries (Section X).

II. Definitions

There are a variety of different grades of coal, each with a range of possible uses. The bulk of coal entering world trade is bituminous. In turn, two-thirds of bituminous coal currently traded is classified as metallurgical (or coking) coal, used to make coke for steel production; only one-third is steam (or thermal) coal, used primarily in power generation, industrial heating, and cement making. However, the distinction between steam and metallurgical coal is in how they are used more than in their technical qualities, and there exists some potential for substitution between the two.

Future demand for metallurgical coal will be a function of increases in world steel production, and hence is not an energy issue per se. Steam coal, on the other hand, is a ready substitute for oil and other fuels in some uses, particularly power generation. Hence demand for steam coal has varied considerably depending upon the availability and price of oil. It has expanded rapidly in the past few years as oil prices have multiplied, and is generally projected to continue to do so through the remainder of this century. This paper focuses on steam coal.

III. Current Coal Use in Developing Countries

With a few exceptions, developing countries do not presently consume much coal, especially steam coal. Oil-importing developing countries (OIDCs) consumed 122.8 million tons coal equivalent (mtce[1]) of solid fuels (mostly coal, but also some lignite, peat, coke, etc.) in 1978, only 4% of the world total (see Table 1). Only 31 of the more than 100 LDCs covered in this survey, 19 of them

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[1] The standard measure of coal, defined as having a heating potential of 7,000 kilocalories/kg or 12,600 BTU/lb. 1 mtce = 0.67 million tons of oil equivalent.

OIDCs, consumed as much as 50,000 tons of coal in 1978. India, Korea, Brazil, Mexico, Turkey, Colombia, Taiwan, Rhodesia, Argentina, Chile, Egypt, and Iran were the only ones to consume at least 1 million tons.

Of total LDC solid fuels consumption, probably not much more than half was used for steam, as opposed to metallurgical, purposes (see footnote on page 3 of table 1). Furthermore, with large reserves, India accounts for over 60% of current OIDC production and consumption of coal in general, and perhaps 90% of OIDC steam coal consumption. Although India's coal consumption is projected by the World Coal Study to increase from 74.5 mtce in 1978 to 286 mtce in 2000, she will continue to supply that demand almost entirely from domestic production. Leaving India aside, OIDCs probably used less than 10 mtce of steam coal in 1978.

Another characteristic of LDC coal use is that it relies little on international trade. In 1978, LDCs imported 12.9 mtce, virtually all of which was for metallurgical purposes. Steam coal consumption currently occurs primarily in those LDCs who themselves produce coal or who have immediate neighbors who do.

IV. Prospects for Coal Use in Developing Countries

LDCs have in the past been discouraged from using coal primarily by the ready availability of relatively inexpensive oil, and coal's reputation for being cumbersome, dirty, and hence costly to transport and burn. Recently the disappearance of the first of these factors has enhanced the attraction of coal. Thus far, the move to coal by LDCs has been slow, due in part to inertia and/or fear of experimenting with a fuel with which they have had no experience, in part to reluctance to confront the remaining real and expensive problems associated with using coal. Nevertheless, use of coal, particularly steam coal, in LDCs is on the rise and is expected to increase rapidly during the remainder of this century. The World Coal Study, sponsored in part by DOE with participation of experts from coal-using countries around the world, projected earlier this year on the basis of a cursory survey that LDC coal use (all kinds) could increase to 600-900 mtce by the end of the century (India accounting for 280 mtce). The recently released World Bank study, "Energy in the Developing Countries" and the Bank's 1979 study on "Coal Development Potential and Prospects in the Developing Countries" project LDC energy use to 1990 based on more detailed data. We draw heavily on these reports for the analysis contained in this paper.

As noted above, steam coal is most readily substitutable for oil in electricity generation, industrial heating, and cement-making. Electricity generation is and will remain the most important of these. Also, data on fuel use are much better for the electricity than for other sectors. Hence, analyses of the future of steam coal tend to concentrate their focus on this sector. While this practice entails some underestimation of the potential demand for coal, we are satisfied that the underestimation is not too serious in the case of LDCs, and hence have adopted the practice for purposes of this paper.

Based on a detailed country-by-country and project-by-project analysis, the World Bank estimates that LDC electricity consumption will increase at an average annual rate of 8-9% through the next ten years (see Tables 2-3). Hydropower capacity is expected to double, but its share will decline. Nuclear power will increase its share somewhat. However, the dominant form of power will remain thermal. Within this latter category, coal and gas-fired generation will increase at the expense of oil-fired. Specifically, coal/lignite consumption for electricity production will increase from 0.81 million barrels per day of oil equivalent (mbdoe) (about 61 mtce/year) in 1980 to 2.15 mbdoe (161 mtce/year) in 1990. At the same time, oil use, while accounting for a declining share of electricity production, will increase in volume from 1.44 mbdoe (108 mtce/year) in 1980 to 2.06 mbdoe (155 mtce/year) in 1990.

The above projections are very specific. This is because the lead time required to plan and construct a power plant, especially in a developing country, approaches ten years, and hence almost all of the power plants which will be operating in 1990 are already at least on the drawing board. Beyond 1990, the projections are much less precise. It is in this period that current energy development programs of the U.S. Government, the World Bank, and other development assistance institutions can begin to make an important contribution to alleviating LDC energy problems. The following sections discuss the principal factors influencing the extent to which LDCs will continue to expand their use of coal in that timeframe.

A. Attraction of Coal Relative to Other Fuels

A decision to use coal as opposed to some other fuel requires consideration of both price and non-price issues. Currently, although coal prices vary considerably depending upon quality and transportation requirements (see Table 4), they are in all cases only a fraction of oil prices on a dollar per BTU basis. The prospects for coal maintaining this advantage over the long term are uncertain. Some observers believe that the gap will narrow as a result of increasing demand for coal and especially inter-fuel substitution. However, the predominant expectation, espoused by the IEA, the World Bank, and the World Coal Study, is that, because of the enormity and widespread distribution of coal reserves, coal supplies will remain abundant despite inter-fuel substitution and hence that the price differential will probably not narrow much. Coal prices have more than doubled since 1973, but have still declined relative to oil prices. Increases over the past year have not yet begun to offset the doubling of oil prices in 1979.

Of course, in assessing the competitiveness of alternative fuels, one must assess not only the price of the fuel itself, but also both the capital cost of using it and non-price factors. First, taking capital cost into account, the attraction of coal vis-a-vis oil is much reduced. Coal-fired power plants usually cost significantly more to build and to operate than oil-fired ones, especially if new transportation infrastructure is required (as would be the case in many LDCs) and environmental protection measures are adopted. The up-front costs of extensive new transportation infrastructure alone renders a turn to coal prohibitively expensive for some LDCs. On the other hand, although environmental protection is expensive, the IEA calculated in 1978 that coal-fired electricity generation would be substantially less expensive than oil-fired over the first 20 years of operation for a new power plant even with 100% flue gas desulfurization (see Table 5).

However, last year's doubling of oil prices has already demonstrated the margin of error of such projections. The life of a power plant is at least 20 years. Cost projections over that time period are no longer reliable. This has led decision-makers to de-emphasize them in favor of other considerations in making fuel selections. Such other considerations include long-term reliability of supply, balance of payments effects and the preference for energy autarky (arguing for use of domestically-produced as opposed to imported fuels), and the economies of scale of plants using different fuels. Thus many LDCs, like the OECD countries, are seeking to reduce their dependence on imported oil as a matter of principle based on their aversion to the growing uncertainty of oil availability, to a considerable extent irrespective of the conclusions of current benefit-cost analyses.

As an alternative to oil, coal must compete with natural gas, nuclear, hydropower, solar, and other fuels. Its competitiveness with these is mixed. Gas is currently cheaper than coal per kilowatt-hour of electricity generated in most projects. The cost of nuclear is probably roughly comparable to that of coal. Hydro costs vary from project to project. The technology for large scale use of solar is still being perfected. However, none of these is available to all LDCs: in general gas and hydro can be used only in countries producing them, nuclear is currently an option only for the most industrialized of the LDCs, and solar remains primarily an option for the future. Hence, there will remain a significant number of cases where coal is the only practical substitute for oil over the medium term.

B. Potential for Converting Existing Plant and Equipment from Oil to Coal

Widespread speedy conversion to coal for energy generation in residential/commercial use and in the transport sector is not feasible. Conversion of boilers, heating installations and railway locomotives is almost as expensive as buying entirely new equipment. This is also generally the case for power generation and industrial plants. A few plants originally constructed with dual coal-oil burning capability can and are being readily reconverted to coal. In addition, there are a few existing oil-burning installations where conversion may be viable provided that: (a) the costs of the necessary transportation infrastructure can be shared with other sectors of the economy; and (b) in countries with refineries, the conversion to coal does not add to a surplus of residual fuel oil that is already difficult to dispose of economically. However, most of the increase in LDC demand for coal will necessarily come from construction of new installations.

V. Prospects for Coal Production in Developing Countries

Most developing country governments have in the past made little effort to develop their own coal (or other non-oil energy) resources. Oil, even imported, was cheap, available, relatively clean, and easy to use. Now that the instability of oil, and by extension of other imported fuel, supplies and prices has been brought home to them, many of them are opting for the security which domestic resource exploitation can provide, even if such exploitation is at the moment more expensive than imported alternatives. Virtually all countries with domestic hydro, oil, or gas resources, or hope of discovering them, are giving top priority to their development. The many problems associated with coal production have generally caused it to receive somewhat lower priority. However, interest in it is growing too, stimulated by World Bank and other development bank efforts.

India, Korea, Turkey, Mexico, Brazil, Colombia, Taiwan, and Zimbabwe are the only LDCs currently producing more than 1 million tons of coal annually. However, 23 LDCs produced at least 50,000 tons of coal and lignite in 1978, and about 50 LDCs have known geological coal resources (see Table 6). The World Bank believes LDC coal production could rise as high as 400 mtce by 1990 (but only 210 mtce excluding India) with determined action by countries with major known coal potential. Most of this growth will be in countries that are already large producers. However, Botswana, Indonesia, Swaziland, Thailand, and Venezuela could also be producing over 5 million tons each by 1990; the Philippines and Mozambique are projected to reach 3-4 million tons by 1990; and Egypt, Haiti, Madagascar, Niger, and Tanzania could initiate production by 1990 at an average level of perhaps 600,000 tons per year.

Constraints to LDC coal production include the availability domestically of more attractive energy sources, a serious lack of geological data and feasibility studies, the inaccessibility and low economic viability of many deposits, and inadequate technical knowledge. Financing for mining and transportation will be a problem for some countries too. However, it appears that it is not lack of funds, but instead the low priority given by LDCs to coal development, which in the first instance accounts for the paucity of coal production projects in preparation. Bilateral exploration grants and UNDP funds for coal development are often not used expeditiously and the UN Revolving Fund for Natural Resources Exploration has not made any loans for coal exploration due to lack of demand.

VI. Prospects for LDC Imports of Coal

Little analysis has been done of the benefits to OIDCs of substituting coal imports for oil imports, nor of the countries which might pursue those benefits. In general, the benefits of importing coal would fall into two categories:

-- reduction of the drain on national income of expenditures on energy to the extent that the cost of coal is less than that of oil on a BTU-generated basis. This should be of significant interest to OIDCs since the savings would be in foreign exchange. On the other hand, they would be only a fraction of the foreign exchange savings of a country able to develop its own coal or other energy resources.

-- improvements in the security of energy supplies and prices. This issue has several facets. First, the increasing unreliability of oil exporting nations as sources of supply and the generally unsettled nature of oil markets of late have made oil importation a very risky business. Coal trade by contrast tends to be much more stable. It is dominated by long term (in many instances, 10-20 year) contracts specifying both quantities to be supplied and criteria for price increases. The major exporters - Australia, Canada, the United States, Poland and South Africa - appear for the moment to be more reliable suppliers than many of the oil producers. On the other hand, uncertainty enters into the picture in these countries too, primarily in the form of labor strikes. The Japanese (the world's largest importers of coal) suffered this past summer from a miners' strike in Australia, their major supplier. Purchasers of Polish coal also are encountering problems. United Mine Workers strikes are frequently mentioned as a source of concern by potential buyers of U.S. coal. Not only the Japanese, but also Europeans allude to the possibility of a government-imposed export embargo to protect domestic coal users - a la soybean embargo of 1971 - in the face of a strike, although this has never occurred. In sum, reliability is never absolute where imports are concerned, but is probably better in the coal than in the oil trade.

OIDCs who fit the following description might benefit from importation of coal:

-- projected medium-term expansion of electricity generating capacity using imported fuel exceeds 100 MW. Few existing oil-burning plants are readily convertible to coal, especially in small countries which usually lack necessary coal handling infrastructure. If domestic energy resources, particularly hydropower, are available, most countries will opt for developing them rather than continuing to rely on imports. 100 MW is about the minimum scale necessary to support construction of coal transportation, handling, and storage systems.

-- the country is littoral. In most cases, construction of an extended inland coal transportation system will be prohibitively expensive.

-- domestic oil refineries are not, and are not projected to begin, producing large quantities of residual fuel oil for which the only ready customers are domestic oil-fueled power plants.

We have performed a cursory country-by-country survey using the above criteria in an attempt to assess generally what LDC demand for U.S. coal could develop in the remainder of the century (Table 7). The following is a summary of our results:

-- Of the 76 OIDCs considered, 18 appear worthy of attention as potential U.S. coal importers, and 12 more fall into the "perhaps" category.

-- Likely prospects fall primarily into two subcategories:

-- seven rapidly industrializing developing countries -- Korea, Taiwan, Philippines, Hong Kong, Singapore, Thailand, Israel -- account for at least 80% of the total potential demand of OIDCs for coal imports. These countries have already taken the decision to expand coal imports as a substitute for oil imports and in most cases they have already entered the international coal market as buyers. The World Coal Study projects total coal imports by East Asian countries at 47 mtce in 1990 and 149-179 mtce in 2000 (Korea and Taiwan would account for 80-90% of this total). Even if these projections are high, there is no question that Korea and Taiwan will be among the major buyers of coal on the international market by the end of this century.

-- more numerous, but much less certain, and also much less significant as potential clients, are a group of small energy resource-poor OIDCs primarily in the Caribbean and Central America: Bahamas, Barbados, Costa Rica, Dominican Republic, Guatemala, Jamaica, Nicaragua, Panama, Cyprus, and Mauritius. These countries are by and large very small energy consumers. For many of them, oil imports are the exclusive source of energy. Few of them have ever developed any expertise in alternative fuels.

It is unlikely that, even with serious effort and strong incentives, these countries' demand for imported coal would reach 10 mtce by 2000.

-- There is practically no prospect for U.S. coal exports to Africa in this century.

-- Most of the larger South American developing countries have sufficient domestic energy resources to support medium-term electricity demand requirements.

-- More generally, almost all countries with domestic energy resources are giving priority to their development. For example, LDCs are spending a great deal on hydropower development these days.

VII. Competitiveness of the United States as a Coal Exporter

Over the next twenty years, the world steam coal market is expected to undergo a radical transformation. In 1978, trade in steam coal was only about 60 mtce (about half the trade in metallurgical coal). The World Coal Study projects that this trade will reach 125-175 mtce by 1990, and anywhere from 300 to 680 mtce by 2000, depending upon one's assumptions regarding growth in oil supplies, rate of increase in nuclear power generation, and general rapidity of substitution of coal and other fuels for oil.

Currently, the major exporters of coal are the United States, Poland, Australia, the USSR, South Africa and Canada. Over the longer term, the United States, Australia, and to a lesser extent South Africa and perhaps the USSR are projected to be the dominant exporters.

The competitive position of U.S. steam coal in the international market is ambiguous. U.S. coal is not currently price competitive in world markets. DOE estimated last year that the cheapest U.S. coal is 18% more expensive than Australian coal delivered to Europe, 31% more than South African coal, and 27% more than Polish coal (see Table 4). Similar margins prevail in the Far Eastern markets. For this reason, many buyers are accustomed to looking to the United States as a supplier of last resort.

Fortunately for U.S. coal producers, current price is not the sole consideration in the international coal market. Many importers are seeking to diversify their sources of supply as a matter of policy in spite of significant price disparities. In addition, many steam coal users prefer to obtain their coal through long-term (10-20 year) contracts and hence select their suppliers on the basis of projections of a country's competitiveness and reliability over the life of the contract.

It is presumably these factors which are causing importers to begin to turn to the United States for coal supplies. The United States promises to be a large and stable supplier of coal for the foreseeable future. Despite their high prices, U.S. steam coal exports began to rise rapidly in 1979 and have continued to do so this year (see Table 8). Coal delegations from many coal-importing countries have visited the United States in the last year to evaluate the prospects for U.S. coal exports in coming years and the problems related thereto, and to negotiate purchase contracts with U.S. companies.

The message which these delegations bring is that they fully expect the United States to become a major exporter of coal in the future, but they are concerned at our lack of preparation to play that role. In particular, U.S. railroad and port facilities for coal are woefully inadequate. For example, from the East Asian standpoint, the fact that capacity for handling coal in West Coast ports is practically non-existent is a serious drawback. In addition, the foreign delegations express concern at excessive federal and state regulation, and delays in leasing of federal coal lands for development.

Both the public and the private sectors in the United States are slowly beginning to address these problems. The Interagency Coal Export Task Force is preparing recommendations for the President on the role of government in solving these problems. The Corps of Engineers is dredging ports to allow them to accommodate modern, large coal carriers, but experience delays waiting for Congressional authorization. The private sector is upgrading some of its transportation infrastructure (frequently with assistance from government), and beginning to take a serious interest in satisfying the needs of potential foreign buyers, which often differ radically from traditional domestic buyers.

In sum, it appears that although the high price of U.S. coal has limited its marketability in the past, it will be less of a factor in the future as the international market for steam coal grows and demand begins to stretch cheaper suppliers. Expensive as it may be, U.S. coal is, and, as discussed earlier, is generally expected to remain, cheaper than oil. This, and the projected increases in world demand for steam coal which arise from it, provide strong assurance that foreign demand for U.S. coal will grow rapidly during the remainder of the century even if the United States remains the supplier of last resort for most buyers.

VIII. Evaluation of the Desirability of a U.S. Development Assistance Program Based on Subsidization of Coal Exports

Surplus capacity and unemployment coupled with abundance of reserves are characteristics of the U.S. coal sector as well as of U.S. grain production. Drawing on these parallels, proposals have been made to create a U.S. development assistance program to promote simultaneously LDC coal use and increased U.S. coal exports. It is envisioned that this program would subsidize coal exports in a manner similar to the P.L. 480 or the Commodity Credit Corporation programs which have supported grain sales (P.L. 480 through outright price subsidization, CCC in the past through prolongation of the term for payment). These proposals, however, overlook at least three distinctions between the international markets for grains and coal, all three factors which undermine the influence of current price, and thus of a possible P.L. 480/CCC for coal over decisions to begin to use coal.

-- Infrastructure requirements: Importing and consuming grain requires little infrastructure. Hence demand for grain is primarily a function of its price. As discussed in Section IV.A., importing and consuming coal can require very expensive infrastructure. This infrastructure is frequently so expensive that the selling price of coal is for many developing countries a less important factor in their consideration of whether to use it than are the up-front capital costs.

-- Time lag between decision to purchase and actual purchases: A decision to purchase grain may be implemented without delay. By contrast, a decision to begin to use coal will in most LDCs be separated from the initation of purchases of coal by the time it takes to construct a coal-fired power plant -- as noted in Section IV, up to ten years.

-- Term of purchase contracts: Grain is traded primarily on a spot basis. This contributes to the importance of price as the equilibrator of supply and demand for grain. As discussed in Section VII, coal trade occurs predominantly under long-term contracts where future rather than current prices are relevant.

These three characteristics of coal use and trade would prevent a P.L. 480/CCC for coal from triggering an acceleration in the rate at which LDCs are turning to coal as a substitute for oil.

Of course, to the extent one is concerned solely with expanding U.S. coal exports, one might consider a coal price subsidization program simply as a means of expanding the U.S. share of the current market for coal in LDCs relative to that of other exporters. In this case, one would ignore the small, poorer OIDCs identified in Section VI as possible coal importers, and instead target those seven more industrialized OIDCs who are already or are about to begin participating as buyers in the international coal market (to the extent they are buying spot). However, such a program would be difficult to justify as development assistance because these countries do not qualify under current guidelines for the degree of subsidization (as discussed in Section VII, probably at least 10-20%) which would be required to overcome the price advantage of Australian and South African coal in today's market.

We conclude that subsidization of U.S. coal export prices is not justifiable on development assistance grounds. On the other hand, we might be able to mold parts of our broader energy-related assistance program to promote coal use, including coal imports, by LDCs. We explore this possibility in the last two sections of this paper.

IX. Existing Coal-Related World Bank and U.S. Government Energy Development Assistance Programs

World Bank: The World Bank is by far the largest source of international public support for energy development in LDCs, and is already quite active in promoting production and use of coal in LDCs. Its currently planned lending program for energy for the period 1981-85 amounts to $13 billion, about 17% of its total projected lending commitments. The Bank's July proposal for an increased energy program would enlarge this total to $25 billion (see Table 9). This would constitute about 9% of total projected LDC energy investment requirements for this period.

A small part of this sum is to be devoted to "energy sector reviews." These are similar to, but much less comprehensive than, the country energy assessments offered by DOE and AID. They are performed by Bank teams based on 3-4 week visits to subject countries. The Bank hopes to have completed 60 of these by 1983.

The bulk of Bank funds go to major projects. Electricity generation projects have in the past received over 50% of Bank energy lending, and most of these have been hydro and coal powered (see Table 10). $11 billion of the proposed enlarged program would go for electric power projects.

The Bank also hopes to more than double the size of its coal/lignite production program to $2 billion. Funds would be made available for exploration, feasibility, and engineering studies of coal projects, financial studies to identify prospects for coal use, and actual coal mining and transport projects.

U.S. Government Energy Assessment Programs for LDCs:

Such programs attempt to bring together all the information necessary for a country to develop a coherent energy plan for itself. The DOE-funded Country Energy Assessment Program, conceived of by Congress as a means of discouraging nuclear proliferation in the Third World, is fairly modest, engaging in programs in only 2-4 countries (non-recipients of U.S. bilateral assistance) at a time, but spending as much as $1 million and 1 year per country (most of the work is actually performed by private contractors). The AID program complements the DOE program by performing similar assessments for U.S. development assistance-recipient LDCs. These, though less comprehensive in their actual assessments, place heavier emphasis on energy planning, institution-building, and training than DOE's. Both programs stress avoidance of interference in ultimate planning decisions by the recipient country leaders.

Other USAID Programs: Major facets of AID's energy program include an emphasis on training and institutional development to help countries expand their capability to implement effective national energy policies; site testing and demonstration to determine the feasibility of renewable energy technologies; and fuelwood/forestry projects to address directly the energy supply requirements for cooking and heating. These activities are miniscule in comparison with the World Bank's, but growing. FY 80 funding was $35 million. FY 81 funding is projected to exceed $60 million. AID has requested over $100 million in FY 82 and is planning further increases of 25-40% per year through 1986. Future expansion of the program is expected to concentrate somewhat on more capital intensive projects related to fuelwood and small-scale hydropower generation, and feasibility studies for large capital projects in preparation for funding of construction by the World Bank or other financial institutions.

X. Options for Promoting LDC Use of Coal through the U.S. Energy Development Assistance Program

As discussed in Sections IV and V, the primary deterrents to increased LDC use of coal are their lack of familiarity with it, its reputation for being cumbersome and dirty to use, and the high cost of constructing coal transportation infrastructure and coal-fired power plants. To the extent that we wish to promote LDC use of coal, particularly U.S. coal, we should seek to counteract these deterrents.

Looking at the last, and probably the most important, deterrent, we note first that the World Bank and other development institutions are already devoting substantial resources to coal-related projects in LDCs; and, second, that the limited size of the U.S. development assistance program probably precludes substantial U.S. involvement in funding of the capital development necessary for coal use. However, as mentioned in Section IX, USAID is contemplating increased support of feasibility studies for large capital projects in the energy area. USAID could earmark a portion of the funds available for this purpose and for technical assistance for coal-using projects.

USAID can be more effective in combatting the first two deterrents. Ignorance can be overcome with education. The technical problems of using coal, while real, can be dealt with using technology and know-how. We already have education and technical assistance programs which could be oriented to respond to the needs of potential coal users.

First, we could improve our energy assessment effort, combining the best characteristics of the DOE and USAID programs. Energy assessments, by providing the LDC policymaker with comprehensive data on the energy picture confronting his country and the options available to it, would steer him in the direction of coal if it were a promising alternative, and begin to educate him as to its merits. Although better than those of other aid donors, our current energy assessment effort is inadequate and poorly focused. The DOE program is limited by its non-proliferation orientation to the more industrialized developing countries. Also, it lacks almost entirely an institution-building component (preparation of a thick report is not productive if there are insufficient personnel qualified to make use of the data contained in it or of other data which subsequently become available). The AID program is too modest. While it pays lip service to institution-building, the less-than-a-year duration and limited size of most of its projects suggest that this commitment is not fulfilled very well. The overall energy assessment program should be consolidated, expanded, and made more flexible, so as to be able to support, for example, longer-term (five years?) projects where institution-building is the primary need.

To the extent that we wish to attach priority to OIDC coal use, we could initially target the program on those countries which we determine beforehand would benefit from using coal. At the same time, it should be noted that, from an energy policy standpoint, we have an interest in promoting rational use of all energies, and hence in making energy assessment assistance available to all countries which can use it.

Second, we could provide increased funding for undergraduate and graduate university education in energy-related fields for students from LDCs.

In sum, given the limited resources of USAID's energy development program, we do not believe it would be appropriate to create a large program designed especially to promote coal to the exclusion of other fuels equally or better suited to the needs of individual LDCs. At the same time, we believe that programs which educate the LDC policy-maker to the energy options available to him will be successful in stimulating use of coal by those LDCs for whom coal is in fact a desirable alternative. These, together with funding for technical assistance and feasibility studies related to coal-using projects, although indirect, are our best bet for promoting LDC imports of U.S. coal for at least the next ten years.

[illegible] and Installed Electricity Generation Capacity - 1978
(energy in million metric tons of coal equivalent, electricity in megawatts)

	Production					Trade					Consumption					Electricity Generation Capacity			
						Imports		Exports											
	Coal & Lignite	Crude Petroleum & Natural Gas Liquids	Natural Gas	Hydro-Nuclear Electricity	TOTAL	TOTAL	of which: Solid Fuels	TOTAL	of which: Solid Fuels	Bunkers	Solid Fuels	Liquid Fuels	Natural Gas	Hydro-Nuclear Electricity	TOTAL	Thermal	Hydro	Nuclear	TOTAL
World	2786.1	4556.7	1734.6	257.0	9332.4	3316.2	218.1	3301.5	216.6	220.4	3002.0	3959.2	1726.9	256.3	8735.2	1,313,555	400,569	106,902	1,821,026
LDC Total	135.4	3533.7	177.4	38.1	3882.0	497.8	12.9	2311.9	0.0	63.4	138.9	587.5	138.3	37.4	891.1	101,262	69,260	1,901	172,076
Total LDC Oil Exporters	12.8	2454.6	150.9	9.9	2628.5	78.4	3.4	2225.0	0	32.8	16.1	250.9	105.5	9.8	390.0	33,307	20,003	0	53,310
OIDCs	112.6	69.1	25.5	26.3	233.5	419.4	9.5	86.9	0.0	30.8	122.8	330.6	24.8	27.6	501.1	67,693	49,265	1,901	120,266
Africa	4.0	422.4	26.9	5.7	459.9	46.0	2.4	410.4	0.3	5.3	7.0	61.2	9.0	4.9	82.1	8,216	10,806	0	19,026
Algeria		88.2	10.9	0.1	99.2	1.4	0.2	85.1		0.2	0.2	6.3	6.1	0.1	12.7	870	330		1,200
Angola		12.1	0.1	0.1	12.3	0.4		10.9		0.4		1.1	0.1	0.1	1.3	155	368		523
Benin					0	0.2						0.2			0.2	15			15
Cameroon				0.2	0.2	0.7				0.1		0.6		0.2	0.8	83	263		346
CAR					0	0.1						0.1			0.1	6	11		17
Chad					0	0.1						0.1			0.1	23			23
Congo		2.4			2.4	0.2		1.9				0.2			0.2	17	17		34
Djibouti					0	0.6		0.7				0.1			0.1	24			24
Egypt		21.6	1.4	1.1	24.1	1.7	1.3	16.2		0.1	1.3	16.5	1.4	1.1	18.3	1,499	2,445		3,944
Ethiopia					0	0.9		0.3				0.5			0.6	114	206		320
Gabon		16.7	0.3		17.0			16.1		0.1		0.7	0.2		1.0	87	3		90
Gambia					0	0.1						0.1			0.1	8			8
Ghana				0.5	0.6	1.8		0.5				1.3		0.5	1.8	108	792		900
Guinea					0	0.4						0.4			0.4	125	50		175
Ivory Coast					0	2.5		0.7				1.9			1.9	270	232		502
Kenya				0.1	0.1	4.1	0.1	1.4		0.8	0.1	1.9		0.1	2.1	183	173		356
Liberia					0	0.8				0.1		0.7			0.7	225	75		300
Libya		140.5	5.1		145.6	0.9		139.2		0.1		4.7			4.7	888			888
Madagascar					0	0.9		0.0				0.6			0.7	55	40		95
Malawi					0	0.3	0.1				0.1	0.2			0.3	44	72		116
Mali					0	0.2						0.2			0.2	37	6		43
Mauritania					0	0.3						0.3			0.3	40			40
Mauritius					0	0.5				0.2		0.4			0.4	135	20		155
Morocco	0.7		0.1	0.2	1.0	5.2		0.1	0.1	0.3	0.7	4.5	0.1	0.2	5.5	568	412		980
Mozambique	0.5			0.8	1.3	1.3	0.3	0.9	0.1	0.1	0.7	0.7		0.1	1.5	280	1,117		1,397
Niger					0	0.2						0.2			0.2	20			20
Nigeria	0.3	130.8	0.7	0.3	132.1	3.0		127.3		0.1	0.3	6.0	0.7	0.3	7.3	540	420		960
Reunion					0	0.4						0.4			0.4	74	26		100
Rhodesia	2.5			0.4	2.9	1.2		0.1	0.1		2.4	0.9		0.7	4.0	487	705		1,192
Rwanda					0	0.1						0.1			0.1	3	35		38
Senegal					0	2.5		0.2		1.6		0.9			0.9	130			130
Sierra Leone					0	0.5				0.2		0.3			0.3	93	2		95
Somalia					0	0.4						0.3			0.3	18			18
Sudan				0.1	0.1	3.0						2.8		0.1	2.9	110	110		220
Tanzania				0.1	0.1	1.4		0.2		0.1		1.0		0.1	1.1	80	100		180
Togo					0	1.0		1.2				0.2			0.2	22	2		24
Tunisia		6.3	0.4		6.7	3.1	0.1	6.1		0.1	0.1	2.8	0.4		3.3	503	29		532
Uganda				0.1	0.1	0.6						0.5		0.1	0.6	7	160		167
Upper Volta					0	0.2						0.2			0.2	30			30
Zaire	0.1	1.7		0.5	2.3	1.5	0.2	1.7		0.1	0.3	1.1		0.5	1.9	58	1,159		1,217
Zambia	0.7			1.1	1.8	1.4	0.1	0.5		0.1	0.8	1.1		0.7	2.6	272	1,438		1,710

*Excluding those LDCs whose total production and/or consumption of primary energy is less than 50,000 tce/year. Also excludes Botswana and Swaziland since both of these appear in the source data only in the aggregation of the South African Customs Union. Both of these have the potential to become significant exporters of coal.

Source: United Nations World Energy Supplies 1973-1978.

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	Production					Trade					Consumption					Electricity Generation Capacity			
	Coal & Lignite	Crude Petroleum & Natural Gas Liquids	Natural Gas	Hydro-Nuclear Electricity	TOTAL	Imports TOTAL	Imports of which: Solid Fuels	Exports TOTAL	Exports of which: Solid Fuels	Bunkers	Solid Fuels	Liquid Fuels	Natural Gas	Hydro-Nuclear Electricity	TOTAL	Thermal	Hydro	Nuclear	TOTAL
Western Hemisphere	17.0	350.0	59.6	21.9	457.2	204.4	7.5	230.6	0	16.5	24.4	259.5	59.3	21.9	365.0	36,365	38,436	0	75,347
Antigua					0	0.2		0.1				0.1			0.1	26			26
Argentina	0.4	33.9	10.0	0.9	45.2	9.2	1.2	0.6		0.4	1.6	34.3	12.6	1.0	49.6	7,081	2,020		10,275
Bahamas					0	15.0		19.4		0.9		1.7			1.7	255			255
Barbados		0.1			0.1	0.5				0.2		0.3			0.3	105			105
Belize					0	0.1						0.1			0.1	14			14
Bermuda					0	0.4				0.2		0.2			0.3	96			96
Bolivia		2.6	2.2	0.1	4.9			2.7				2.0	0.1	0.1	2.2	112	307		419
Brazil	4.3	12.2	1.6	12.7	30.7	69.2	4.4	2.2		2.3	8.7	68.7	1.6	12.7	91.7	3,725	20,355		24,200
Chile	1.1	2.0	1.0	0.9	5.0	6.0	0.5	1.0		0.1	1.6	7.0	0.9	0.9	10.0	1,450	1,475		2,925
Colombia	4.0	10.4	3.0	1.3	18.7	3.0		2.0		0.4	4.0	9.0	3.0	1.3	17.3	1,330	2,445		3,775
Costa Rica				0.2	0.3	1.0						1.0		0.2	1.2	201	239		440
Cuba		0.1			0.1	12.4	0.1				0.1	11.6			11.7	1,030	46		1,076
Dominican Republic					0	3.5						2.4			2.4	750	150		900
Ecuador		14.5	0.1	0.1	14.6	1.4		11.9		0.3		3.8	0.1	0.1	3.9	595	150		745
El Salvador				0.1	0.1	1.1						1.1		0.1	1.2	195	316		511
Guadeloupe					0	0.3						0.3			0.3	75			75
Guatemala				0.1	0.1	1.0				0.2		1.7			1.7	280	130		410
Guyana					0	0.9						0.9			0.9	100			100
Haiti					0	0.3						0.2			0.3	35	67		102
Honduras					0.1	1.0						0.9		0.1	1.0	94	70		164
Jamaica					0	4.3		0.1		0.2		3.8			3.9	690	15		705
Martinique					0	0.6		0.3				0.4			0.4	63			63
Mexico	7.1	89.7	10.9	2.7	110.4	2.0	0.8	22.0		0.1	7.0	63.2	10.9	2.6	92.6	10,100	5,600		15,700
Netherlands Antilles					0	46.0		33.7		3.6		5.5			5.5	290			290
Nicaragua					0	1.1						1.2			1.2	211	117		350
Panama					0	4.7		0.9		2.0		1.8			1.8	350	190		540
Paraguay				0.1	0.1	0.5						0.5		0.1	0.6	64	175		340
Peru		10.4	0.7	0.8	11.9	2.5	0.2	2.6		0.1	0.2	9.3	0.7	0.8	10.9	1,105	1,415		2,520
Surinam				0.2	0.2	0.8						0.8		0.2	1.0	190	200		390
Trinidad		17.7	3.3		20.9	13.5		27.2		1.7		2.4	3.3		5.6	454			454
Uruguay				0.2	0.2	3.0				0.1		2.8		0.2	3.0	605	245		850
Venezuela	0.1	165.2	18.0	1.6	184.9	0.3	0.3	140.2		1.7	0.4	19.2	18.0	1.6	39.2	3,075	2,425		5,500
Mid-East	8.0	1561.6	57.7	1.9	1629.4	72.0	0.2	1485.0	0	27.5	0.7	100.3	43.4	2.0	146.5	15,283	3,619	0	18,902
Bahrain		3.9	3.1		7.0	16.0		16.3		1.6		0.4	3.1		3.6	240			240
Cyprus					0	1.3		0.1				1.2			1.2	269			269
Iran	0.9	387.0	39.5	0.5	427.9	0.1	0.1	359.0		6.5	1.0	34.1	28.1	0.5	63.7	4,450	850		5,300
Iraq		189.6	2.1		191.0			174.7		0.2		5.7	2.1		7.8	860			860
Israel				0.1	0.1	12.2		2.0				8.7	0.1		8.7	2,500			2,500
Jordan					0	1.9		0.2				1.6			1.6	130			130
Kuwait		157.6	5.5		163.1			146.6		4.0		2.6	5.5		8.1	1,650			1,650
Lebanon				0.1	0.1	3.3		0.2		0.4		2.8		0.1	3.0	362	246		608
Oman		23.1			23.1	1.0		23.1		0.1		1.7			1.7	176			176
Qatar		32.9	1.9		34.8	0.1		33.1				0.5	1.9		2.4	239			239
Saudi Arabia		616.6	0.9		617.5	1.2		593.7		12.0		11.9	0.9		12.8	650			650
Syria		14.7	0.7	0.2	15.6	4.4		11.6				6.9	0.7	0.2	7.8	417	523		940
Turkey	7.1	3.7		1.1	11.9	23.1	0.1			0.2	7.7	25.3		1.2	34.3	3,000	2,000		5,000
UAE		132.5	3.9		136.4	2.0		134.5		0.2		3.6	1.0		4.5	350			350
Yemen					0	0.4						0.4			0.4	30			30
Democratic Yemen					0	3.3		2.0		0.2		0.9			0.9	70			70

	Production					Trade					Consumption					Electricity Generation Capacity			
						Imports		Exports											
	Coal & Lignite	Crude Petroleum & Natural Gas Liquids	Natural Gas	Hydro-Nuclear Electricity	TOTAL	TOTAL	of which: Solid Fuels	TOTAL	of which: Solid Fuels	Bunkers	Solid Fuels	Liquid Fuels	Natural Gas	Hydro-Nuclear Electricity	TOTAL	Thermal	Hydro	Nuclear	TOTAL
Far East	95.6	180.9	33.2	6.6	316.3	176.6	2.0	157.1	0.5	16.1	90.0	130.6	18.6	6.6	201.3	41,310	16,407	1,981	59,698
Afghanistan	0.2		3.4	0.1	3.7	0.6		3.4			0.2	0.6		0.1	0.9	90	245		335
Bangladesh			1.3	0.1	1.4	2.3	0.4				0.4	1.8	1.3	0.1	3.6	860	110		970
Brunei		15.2	12.4		27.6			25.3				0.2	2.0		2.1	147			147
Burma		2.1	0.2	0.1	2.5	0.2					0.3	1.5	0.2	0.1	2.0	253	197		450
Hong Kong					0	9.9		0.3		2.0		7.6			7.6	2,971			2,971
India	73.2	16.4	1.0	5.2	96.6	24.0		0.5	0.5	1.1	74.5	32.1	1.0	5.2	112.6	16,710	9,450	640	26,800
Indonesia	0.3	133.3	7.6	0.3	140.5	0.3		91.3		0.6	0.3	30.4	5.9	0.3	40.0	1,110	550		1,650
Korea	17.0		0.6	10.3	30.5	30.5	2.1	0.3		0.2	19.0	30.7		0.6	50.3	5,627	711	564	6,902
Malaysia		14.2	0.1	0.1	14.5	0.0		13.4		0.3		8.3	1.0	0.1	9.5	1,225	350		1,575
Nepal					0	0.1						0.1			0.1	27	37		64
Pakistan	0.8	0.7	6.4	0.7	8.6	5.9		0.6		0.2	0.8	5.3	6.4	0.7	13.2	1,232	867	137	2,236
Philippines	0.2			0.6	0.9	16.2	0.1	0.5		0.4	0.3	14.0		0.6	15.7	2,500	1,260		3,760
Singapore					0	41.9		21.9		10.6		5.7			5.7	1,470			1,470
Sri Lanka				0.2	0.2	2.5						1.5		0.2	1.6	86	335		421
Taiwan	2.9										2.9					5,020	1,365	640	7,020
Thailand	0.2			0.6	0.7	16.7				0.1	0.2	14.0		0.6	14.7	1,090	930		2,020

Footnote to Table: Given the impossibility of distinguishing reliably between metallurgical and steam coal (the distinction is primarily in how they are used; there exists considerable overlap in their chemical qualities), the data on solid fuels in this table aggregates the two, so that coal used as a fuel as opposed to a raw material for coke is in fact only some fraction of the figures shown. Nor is it easy to estimate how large this fraction is. In India, 22% of coal consumed goes to the metallurgical sector. For Korea and Africa this figure is about 25%. In Latin America, by contrast, the metallurgical sector takes over 60% of total coal consumed.

Table 2

✓Table 21: ELECTRICITY PRODUCTION IN DEVELOPING COUNTRIES, 1980-90

	1980		1985		1990	
	Terawatt Hours	Percent	Terawatt Hours	Percent	Terawatt Hours	Percent
Thermal						
Oil	272	30.5	346	25.0	388	19.2
Gas	55	6.2	131	9.5	213	10.5
Coal/Lignite	154	17.2	255	18.4	404	20.0
Subtotal	481	53.9	732	52.9	1,005	49.7
Hydro	394	44.2	592	42.7	777	38.4
Nuclear	15	1.7	51	3.7	225	11.1
Geothermal	2	0.2	10	0.7	15	0.8
Total	892	100.0	1,385	100.0	2,022	100.0

Table 3

✓Table 27: DEVELOPING COUNTRIES: COMMERCIAL ENERGY USED TO PRODUCE ELECTRICITY, 1980-90

(Million barrels a day of oil equivalent)

	1980	1985	1990	Average Annual Percentage Growth 1980-90
Thermal				
Oil	1.44	1.84	2.06	3.7
Gas	.29	.70	1.13	14.6
Coal/Lignite	.81	1.36	2.15	10.3
Subtotal	2.54	3.90	5.34	7.7
Hydro /a	2.10	3.13	4.11	6.9
Nuclear /a	.08	.27	1.20	31.1
Geothermal /a	.01	.05	.08	23.1
Total	4.73	7.35	10.73	8.5
Note: Percentage of Total Commercial Energy Consumed in Electricity Production	25	29	31	

/a Valued at the thermal input required to generate an equivalent amount of electricity.

Source: World Bank, Energy in the Developing Countries, July 1980

[redacted]

Table 4

✓Table 3-1 Indicative Steam Coal Costs and Prices
($ U.S. 1979 per metric ton)

	Price FOB Mine	Mine to Port	Price* FOB Port	Port Loading	Ocean Freight	Port Unloading	Delivered Price Range	Avg.	$/MBTU
To: *NW Europe*									
From: *United States*									
East—Underground	20-35	10-15	30-45	1-2	6-10	2	39-59	49	1.86
West—Surface	8-18	10-20	20-35	1-2	8-11	2	31-50	41	2.19
Canada									
West—Surface	15-20	10-20	25-35	1	8-12	2	36-50	42	1.92
Australia									
Underground	15-25	5-10	20-25	2	10-14	2	34-43	39	1.63
Surface	12-20	5-10	18-25	2	10-14	2	32-43	38	1.52
South Africa									
Underground	10-15	5-7	15-22	1	8-10	2	26-35	31	1.41
Poland									
Underground			23-31	1	5	2	31-39	35	1.46
To: *Japan*									
From: *United States*									
East—Underground	20-35	10-15	30-45	1-2	11-15	2	44-64	54	2.05
West—Surface	8-18	10-20	20-35	1-2	9-12	1	31-50	40	2.00
Canada									
West—Surface	15-20	10-20	25-35	1	8	1	35-45	40	2.00
Australia									
Underground	15-25	5-10	20-25	2	6-8	1	29-36	33	1.38
Surface	12-20	5-10	18-25	2	6-8	1	27-36	32	1.33
South Africa									
Underground	10-15	5-7	15-22	1	9	1	26-33	30	1.36
Poland									
Underground			23-31	1	11-13	1	38-44	40	1.67

* As mine prices and transport costs are given as ranges, FOB port prices are not necessarily the direct sum of the range limits.

Source: U.S. Department of Energy, *Coal Export Study* (1979), page 6, Table 4.

203

Table 5

✓Table F-1 Cost Estimates for Electricity Generation in New Baseload Nuclear, Oil, and Coal-Fired Power Stations
In 1976 dollars; Average Costs per kwh during the first 20 years of operation for new plants commissioning in 1986

Average Cost per kwh over first 20 years ($ mills)	Nuclear	Fuel Oil[1]		Bituminous Coal[2]		
		2 x 600 MW		2 x 600 MW		
	PWR 2 x 1 100 MW	Low-Sulphur HFO conventional	High-Sulphur HFO with 100 % FGD	Without FGD	With 100 % FGD	With 30 % FGD
Capital Cost	14.9	7.5	9.6	9.6	12.4	11.0
Operation and Maintenance Cost	2.4	2.0	4.2	2.2	5.1	3.6
Fuel Cost	6.5	31.0	29.0	10.8	11.3	11.1
Total Average Cost per kwh at 5 500 h/a	23.8 (22.8)[3]	40.5 (40.0)	42.8 (42.2)	22.6 (22.0)	28.8 (28.0)	25.7 (25.0)
7 000 h/a	20.7	38.9	40.8	20.6	26.1	23.3
6 000 h/a	22.6	39.9	42.0	21.8	27.8	24.8
5 000 h/a	25.3	41.2	43.8	23.6	30.0	26.8
4 000 h/a	29.5	43.3	46.4	26.2	33.4	29.8
3 000 h/a	36.3	46.7	50.8	30.6	39.1	34.9
Notes:						
Cost of Construction ($/KW)	$700	$350	$450	$450	$580	$515
Average Fuel Cost for the period 1986-2006 :						
$ per toe (10⁷ kcal)	$25.79	$132	$118	$45	$45	$45
$ per 10⁶ Btu	$ 0.65	$3.33	$2.97	$1.13	$1.13	$1.13
Heat Rate :						
Btu/kwh	10 000	9 325	9 715	9 500	9 880	9 690
kcal/kwh	2 620	2 350	2 445	2 395	2 490	2 440
Memorandum Item :						
Total Cost per kwh at 5 500 h/a in : ($ mills) 1986		34.8	36.4	21.5	27.6	23.5
1990		37.4	38.8	21.9	28.0	23.9
2000		45.2	45.8	22.9	29.1	24.9

h/a : hours per year
FGD : flue gas desulphurisation

Assumptions common to all plants:
i) All costs are expressed in 1976 $ U.S. constant money, 1 mill = 10^{-3} $ U.S.
ii) All plants are assumed to begin operation in 1986.
iii) The capital cost estimates (capital charges) are based on a real discount rate of 10%, over a capital recovery period of 20 years (10% at 20 years = 11.746% p.a.).

Notes:

1. Both of the oil prices shown in the table reflect the assumption that crude oil prices rise by 2.5% p.a. after 1985. The difference between the two oil prices ($15 per toe) reflects a quality differential between high and low-sulphur heavy fuel oils, and it is roughly equal to the cost of desulphurisation at the refinery.
2. The coal price shown in the table ($ 32 per tce) is based on the weighted average price of steam coal delivered to utilities in the OECD area and real coal price escalation of 1% p.a. after 1985, and it is presented here solely for the purpose of illustration. The wide regional and quality-related differences in coal prices will affect coal's competitive position in individual countries. See text.
3. Figures in parenthesis are the alternative estimates based on a real discount rate of 9%, instead of 10%, in the computation of capital charges; thus one percentage point decrease of discount rates leads to approximately 4% decrease of total average cost for nuclear, 1% for oil, and 3% for coal, respectively.

Source: IEA, Steam Coal Prospects to 2000, 1978

Table 6

Table 2-11

COAL PRODUCTION PROSPECTS OF DEVELOPING COUNTRIES

	Recoverable Reserves 1/ Million tce	Production Million tce				Annual Growth Rate (%)	
		1977	1980	1985	1990	1977-85	1985-90
DEVELOPED MARKET ECONOMIES	324,841	1,134.4	1,265	1,476	1,752	3.3	3.5
CENTRALLY PLANNED ECONOMIES	246,304	1,463.4	1,662	2,089	2,610	4.6	4.5
DEVELOPING COUNTRIES							
Africa							
Botswana	3,500	0.2	0.2	0.3	5.0	5.2	73.5
Morocco	(96)	0.6	0.9	1.0	1.1	6.6	1.9
Mozambique	80	0.4	1.0	2.0	3.0	22.3	8.5
Nigeria	90	0.3	0.3	1.0	3.0	16.2	24.6
Rhodesia	735	2.5	4.0	4.6	5.2	7.8	2.5
Swaziland	1,820	0.1	0.5	1.5	5.0	28.6	27.2
Zaire	(73)	0.1	0.1	0.1	0.1	0.0	0.0
Zambia	5	0.8	1.3	1.9	2.5	11.4	5.6
Tanzania	(360)	2/	2/	2.0	3.0	-	8.5
Burundi	n.a.	2/	2/	2/	2/	-	-
Algeria	(20)	2/	2/	2/	2/	-	-
Angola	(500)	-	-	-	2.0	-	-
Cameroon	(500)	-	-	-	-	-	-
Benin	n.a.	-	-	-	-	-	-
Egypt	(80)	-	-	-	-	-	-
Ethiopia	n.a.	-	-	-	-	-	-
Madagascar	(92)	-	-	1.0	2.0	-	-
Malawi	(14)	-	-	-	-	-	-
Niger	n.a.	-	-	-	-	-	-
Sierra Leone	n.a.	-	-	-	-	-	-
Somali	n.a.	-	-	-	-	-	-
Tunisia	n.a.	-	-	-	-	-	-
Total Africa	7,220	5.0	8.3	15.4	31.5	16.8	17.1
Asia							
Afghanistan	(85)	0.2	0.2	0.6	1.0	14.7	10.1
India	33,700	99.7	125.0	145.0	190.0	4.8	5.6
Indonesia	1,430	0.2	0.2	3.5	12.0	42.2	27.4
Iran	193	0.9	1.0	1.5	1.5	6.6	0.0
Pakistan	(1,375)	1.0	1.5	2.0	3.0	9.1	8.5
Philippines	(87)	0.2	0.3	1.6	4.0	23.3	20.1
Korea	386	17.3	19.0	22.0	25.0	3.1	2.6
Taiwan	(680)	2.9	4.0	5.0	6.0	5.7	3.7
Turkey	793	7.6	9.8	13.0	16.2	7.3	4.5
Viet Nam	(3,000)	6.0	10.0	15.0	20.0	12.1	5.9
Thailand	(78)	0.2	0.5	2.0	6.0	33.4	24.6
Burma	(280)	2/	2/	2/	2/		-
Bangladesh	519	-	-	-	2.0	-	-
Brunei	(1)	-	-	-	-	-	-
Malaysia	(75)	-	-	-	2.0	-	-
Laos	n.a.	-	-	-	-	-	-
Total Asia	38,583	136.1	171.5	211.2	288.7	5.7	6.3
Latin America							
Argentina	290	0.5	2.2	3.5	7.5	27.5	16.5
Brazil	8,098	3.5	6.4	10.0	20.0	13.9	14.9
Chile	162	1.2	2.0	2.5	7.5	9.6	24.6
Colombia	443	3.7	5.0	10.0	20.0	13.2	14.9
Mexico	875	6.0	6.7	8.0	9.3	3.7	3.1
Peru	105	2/	0.2	0.3	0.4	*	5.9
Venezuela	978	0.1	1.3	5.0	8.8	*	12.0
Bolivia	n.a.	-	-	-	-	-	-
Haiti	(3)	-	-	-	0.3	-	-
Ecuador	(22)	-	-	-	-	-	-
Guatemala	n.a.	-	-	-	-	-	-
Honduras	(0.2)	-	-	-	-	-	-
Panama	n.a.	-	-	-	-	-	-
Total Latin America	10,951	15.0	23.8	39.3	73.8	12.6	13.4
Europe							
Yugoslavia	8,465	19.8	29.3	38.2	46.0	8.3	3.8
TOTAL DEVELOPING COUNTRIES	65,219	175.9	233.1	304.1	440.6	7.1	7.6
GRAND TOTAL	636,364	2,773.7	3,160.1	3,869.1	4,802.4	4.2	4.4

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* Annual growth rate in excess of 50% due to very low 1977 production base; n.a. - not available.
1/ Figures in parenthesis represent "geological resources," since no "reserve" data available.
2/ Output below 0.1 million tce in 1977.
Sources: Reserves: World Energy Conference, 1977 Shelly and Loy; 1977 Production: US Bureau of Mines; UN- *World Energy Supplies* 1972-77; Supply Forecasts: Shelly and Loy; World Bank projections.

Table 7

Potential for OIDC Imports of U.S. Coal for Electricity Generation by 2000

Country	Potential for U.S. Coal Importation	Comments
Africa:		
Benin	No	Insufficient electricity demand, hydro potential
Cameroon	No	Modest electricity demand, large hydro potential,also oil, gas and coal reserves
CAR	No	Insufficient electricity demand, land-locked
Chad	No	Insufficient electricity demand, land-locked
Djibouti	No	Insufficient electricity demand
Ethiopia	No	Modest electricity demand, difficult transportation problems, hydro potential
Gambia	No	Insufficient electricity demand
Ghana	No	Heavy reliance already on hydro, more hydro-based plants under consideration; becoming an oil producer
Guinea	No	Modest electricity demand, hydro potential
Ivory Coast	No	Hydro potential, soon to become net oil exporter
Kenya	Perhaps	Modest electricity demand, large hydro potential, but already imports small amount of coal
Liberia	No	Modest electricity demand, focus on exploitation of hydro potential, use of residual fuel oil from local refinery for electricity generation
Madagascar	No	Insufficient electricity demand, enormous hydro potential, some domestic coal resources

Country	Potential for U.S. Coal Importation	Comments
Malawi	No	Insufficient electricity demand, land-locked, hydro potential, some indigenous coal resources
Mali	No	Insufficient electricity demand, land-locked, hydro potential
Mauritania	No	Insufficient electricity demand
Mauritius	Yes	Small electricity demand, but also negligible indigenous energy reserves and consequent heavy reliance on imported oil
Morocco	No	Coal produced domestically
Mozambique	No	Coal produced domestically and exported. Focus on development of hydro for electricity generation
Niger	No	Insufficient electricity demand, land-locked, hydro potential, some indigenous coal resources
Reunion	No	Insufficient electricity demand
Rwanda	No	Insufficient electricity demand, land-locked, hydro potential
Senegal	Perhaps	Coal use under study, but electricity demand modest
Sierra Leone	Perhaps	Modest electricity demand, continued heavy reliance on imported oil despite hydro potential
Somalia	No	Insufficient electricity demand,
Sudan	No	Approaching self-sufficiency in oil production, hydro potential
Tanzania	No	Modest electricity demand, indigenous coal resources
Togo	No	Insufficient electricity demand
Uganda	No	Modest electricity demand, land-locked, large hydro potential
Upper Volta	No	Insufficient electricity demand, land-locked, hydro potential

Country	Potential for U.S. Coal Importation	Comments
Zambia	No	Land-locked, heavy reliance on hydro, significant domestic coal production
Zimbabwe	No	Large domestic coal production, land-locked, hydro potential
Western Hemisphere		
Antigua	No	Insufficient electricity demand
Argentina	No	Self-sufficient in gas and for a few more years in oil; also large hydro potential, and a nuclear power program. Energy independence is a primary objective
Bahamas	Yes	Modest electricity demand, but totally dependent on imported oil
Barbados	Yes	Has been heavily dependent on imported oil. However, total electricity demand is modest, and domestic oil production may grow
Belize	No	Insufficient electricity demand
Bermuda	Perhaps	Very small electricity demand, but totally dependent on imported oil
Brazil	Doubtful	Already produces steam coal domestically, and is attempting to expand that production rapidly, also has ambitious hydro and nuclear power expansion programs, and oil shale reserves. Possible that coal mine development will not keep pace with construction of coal-fueled power plants, in which case there may be some demand for imports of coal, but only on an interim basis
Chile	Perhaps	Large domestic coal production but some imports too. Will have to compete with domestic, oil, gas, and hydro resources.
Costa Rica	Yes	Heavy reliance on imported oil for electricity generation as well as hydro

Cuba	Perhaps	Heavy reliance on imported oil for electricity generation, but special relationship with USSR may preclude significant shift to U.S. coal.
Dominican Rep.	Yes	Heavy reliance on imported oil for electricity generation, no domestic energy resources except some modest hydro power.
El Salvador	Perhaps	Currently, primary focus is on hydro and geothermal for new electricity generation. Coal might receive consideration over longer term.
Guadaloupe	Doubtful	Insufficient electricity demand.
Guatemala	Yes	Heavy reliance on imported oil together with hydro for electricity generation. However, entering into domestic oil production.
Guyana	No	Large hydro potential being tapped to supplant imported oil for electricity generation.
Haiti	No	Very low electricity demand, prospects for domestic coal production by 1990.
Honduras	Doubtful	Hydro potential is modest, but sufficient to substitute for imported oil at medium-term levels of demand.
Jamaica	Yes	Almost exclusive reliance on imported oil for electricity generation, no major indigenous energy resources.

Martinique	No	Insufficient electricity demand
Netherland Antilles	Yes	Exclusive reliance on imported oil for electricity generation
Nicaragua	Yes	Heavy reliance on imported oil for electricity generation, but exploitation of hydro potential growing
Panama	Yes	Heavy reliance on imported oil, but focus currently on hydro as substitute. Some indication of indigenous coal resources.
Paraguay	No	Land-locked, primary reliance on hydro for electricity generation.
Surinam	Perhaps	Modest electricity demand, hydro potential.
Uruguay	Perhaps	Heavy reliance on imported oil for electricity generation, but hydro potential also exists.
Mid-East		
Cyprus	Yes	Exclusive reliance on imported oil for electricity generation, no significant indigenous energy resources.
Israel	Yes	Heavy reliance on imported oil for electricity generation, a number of coal-fueled plants currently under construction or in planning could bring demand for imported coal to 9 mtce by 1990.
Jordan	Perhaps	Exclusive reliance on imported oil for electricity generation; no consideration currently being given to coal; transportation might be a problem.
Lebanon	Yes	Heavy reliance on imported oil for electricity generation, hydro potential limited.

Turkey	No	Large domestic coal production.
Yemen	No	Insufficient electricity demand.
Dem. Yemem	No	Insufficient electricity demand.
Far East		
Afghanistan	No	Land-locked, net exporter of natural gas, domestic coal production.
Bangladesh	Perhaps	Produces natural gas and hydroelectricity, but also imports some coal.
Hong Kong	Yes	Exclusive reliance on imported oil for electricity generation, but conversion to coal is high priority. New plants, which will more than double electricity generation capacity by the early 1990s, will be dual oil-coal fueled.
India	No	Current immense consumption of coal, and future increases in it based entirely on domestic production.
Korea	Yes	Embarked on a major program to substitute coal for oil which, despite large domestic production, will make Korea one of the world's largest importers of coal in the 1990s.
Nepal	No	Land-locked, insufficient electricity demand.
Pakistan	Doubtful	Heavy reliance on imported oil, but coal is produced domestically and hydro potential is large.
Philippines	Yes	Heavy reliance on imported oil, but planning for future expansion of electricity generation focuses primarily on coal. Some domestic coal production, but large imports are projected too.

Singapore	Yes	Exclusive reliance on imported oil for electricity generation. Expectation of, but no specific planning for, construction of coal or coal-oil fueled plants in the future.
Sri Lanka	No	Primary reliance on hydro for electricity generation.
Taiwan	Yes	Coal-fueled generation capacity, projected by one estimate to reach 7000 MW by 1989, much higher by 2000, will far exceed domestic coal output, may require imports of as much as 15 mtce for electricity generation, 26 mtce total, by 1989.
Thailand	Yes	Heavy reliance on imported oil for electricity generation, but some indigenous hydro and gas resources, and expanding domestic coal production.

Table 8

U.S. EXPORTS OF STEAM COAL 1/

(Quantity - Net Tons; Value - $000 U.S.)

Destination	January-September 1980 2/		January-September 1979	
	Net Tons	Value 3/ ($000)	Net Tons	Value 3/ ($000)
NORTH AMERICA				
Canada	7,391,572	$ 296,375	8,048,819	$ 313,444
Dominican Republic	289	12	313	53
Mexico	63,600	3,333	38,562	1,816
Other	149	8	261	13
Total	7,455,610	$ 299,728	8,087,955	$ 315,326
SOUTH AMERICA				
Brazil	82,281	$ 4,328	24,273	$ 1,310
Chile	342,593	12,621	27,124	1,280
Other	135	5	2,171	266
Total	425,009	$ 16,954	53,568	$ 2,856
EUROPE				
European Economic Community				
Belgium/Luxembourg 4/	796,772	$ 26,114	17,832	$ 477
Denmark	818,056	31,528	102,104	3,618
France	2,243,669	78,203	-	-
Germany (Fed. Rep.) 4/	389,275	18,850	395,285	19,902
Ireland	114,482	6,286	29,835	1,539
Italy	492,567	18,516	-	-
Netherlands 4/	1,286,541	51,455	12,696	604
United Kingdom	1,622,410	66,932	192	8
Total EEC	7,763,772	$ 297,884	557,944	$ 26,148
Finland	75,001	$ 3,200	-	$ -
Germany (Dem. Rep.)	9,121	434	48,502	$ 2,392
Portugal	12,002	684	5,286	344
Romania	360,544	12,538	-	-
Spain	787,929	34,201	200,648	8,890
Sweden	4,935	433	-	-
Total Europe	9,013,304	$ 349,374	812,380	$ 37,774
ASIA, AFRICA & OTHER				
Egypt	-	$ -	197,231	$ 9,915
Japan	488,701	24,561	210,803	11,055
Korea (Rep. of)	19,803	1,003	-	-
Taiwan	194,550	7,126	959	38
Other	188	7	417	78
GRAND TOTAL	17,597,165	$ 698,753	9,363,313	$ 377,045
Exlcuding Canada	10,205,593	$ 402,379	1,314,494	$ 63,601

Source: National Coal Association

Table 9

Table 33: CURRENT AND DESIRABLE WORLD BANK ENERGY LENDING PROGRAMS, FY 1981-85
(Million current US dollars)

	FY81	FY82	FY83	FY84	FY85	Current FY81-85	Desirable FY81-85
Coal and Lignite /a	230	40	230	230	110	840	2,000
Oil and Gas							
Predevelopment	120	180	320	160	240	1,020	2,410
Oil Development /b	255	260	350	300	590	1,755	3,320
Gas Development /c	210	285	345	200	170	1,210	2,270
Subtotal	585	725	1,015	660	1,000	3,985	8,000
Refineries	0	150	0	0	0	150	1,000
Renewables							
Fuelwood	50	75	100	100	100	425	1,100
Alcohol	0	175	25	0	0	200	650
Subtotal	50	225	100	200	200	775	1,750
Electric Power	1,390	1,405	1,470	1,670	1,655	7,590	11,000
Industrial Retrofitting	0	0	0	0	0	0	1,250
Totals:							
Current Program	2,255	2,570	2,840	2,660	2,865	13,190	
Desirable Program	2,650	3,750	4,950	6,500	7,150		25,000

/a Includes coal gasification projects.

/b Includes heavy oil projects.

/c Includes methanol.

Table 10

✓ Table 32: WORLD BANK ELECTRIC POWER LENDING, FY1979-80
(Million current US dollars)

	FY1976-78 Annual Average	FY79	FY80
Hydro	247	183	782
Coal/Lignite Thermal	150	495	840
Oil Thermal	94	24	0
Gas Thermal	4	219	57
Geothermal	6	9	40
Transmission and Distribution	439	191	580
Rural Electrification	74	234	93
Total	1,015	1,355	2,392
Note:			
In Constant 1980 US Dollars	1,307	1,458	2,392
Number of Projects	19	19	25

PREPARED STATEMENT OF ZACHARIAH ALLEN

Gentlemen, it is indeed an honor for me to have the opportunity to appear before you here today to discuss the problems and prospects exporting high-sulfur coal from the Illinois Basin area to the U.S. to customers overseas. It seems that the Midwest, with approximately 45 billion tons of coal reserves having a sulfur content greater than 1.9 percent, has been dealt a "double whammy" in recent years. First, our own environmental laws favored low sulfur coals either from the Powder River Basin or the Appalachian areas in the East. While some of that imbalance has been corrected, the impact of the correction has yet to be felt in a major way.

More recently we have seen dramatic growth in the need for other major industrial countries, such as Japan and some of the countries of Western Europe, to import thermal coal primarily for the generation of electricity but also for other industrial uses. However, there is a general preference in these markets for coal with sulfur content of less than 1.2 percent. This is due to the fact that, with the exception of Japan, most of the other countries have pursued a compliance coal concept in controlling sulfur dioxide emissions from electric utility generating plants. This situation is expected to change in West Germany and the Netherlands, where some sort of desulfurization, probably scrubbers, will be required in the future. However, as in the United States, that only applies to plants that may be built in the future and, therefore, does not represent an immediate market for our higher sulfur coal producers today.

As you gentlemen may know, F. R. Schwab & Associates performed a market study of thermal coal demand in Western Europe for the Interagency Coal Export Task Force that issued its report earlier this year. Attached to the advance copy of my presentation here today are three tables of data that summarize the findings of our report to the U.S. Department of Energy. Each table covers our forecast for a particular time period, i.e., 1985, 1990, and 2000. Each forecast covers the estimated import requirements of fourteen Western European countries and our estimate of where we think this coal will come from.

These tables are annotated to show that demand is primarily for coal with a maximum sulfur content of 1.2 percent, unless otherwise noted. Where noted, there is a tolerance for higher sulfur, up to 2.5 percent.

Looking at the table of 1985, you can see that the requirements for coal in Belgium, the United Kingdom, Ireland, France, Spain, and Greece have tolerance for coal with over 1.2 percent sulfur. Out of a total estimated import demand of around 95 million metric tons (of coal equivalent), about three and one-half million tons (for Spain) will tolerate up to 2.5 percent sulfur in our judgment. In addition, an additional 14 million tons of demand will tolerate sulfur in the range of 1.2 to 1.8 percent sulfur.

In other words, about 18 percent of the forecasted demand will be open to coals with sulfur in excess of 1.2 percent and only about 4 percent of the forecasted demand will tolerate coal with sulfur of 1.8 to 2.5 percent. We estimate that this percentage tolerating sulfur content over 1.2 percent will drop to about 14 percent of total estimated demand by 1990 and remain at that level through the year 2000.

The principal market tolerating higher sulfur levels is the cement industry. Since the limestone used in making cement can absorb the sulfur in the coal, up to a degree, cement kilns can use coal with sulfur content up to about 2.5 to 3.0 percent, depending on a number of process variables. However, the growth prospects for the cement industry in Europe are modest; hence, coal for that market will comprise a decreasing share of the thermal coal market there.

You have all heard about acid rain. The question of what causes it and what to do about it is getting wider and wider attention not only here in the United States, but also in Western Europe. Some countries, such as England and Germany have pursued a policy of building tall stacks in excess of 200 meters in height to disperse SO_2. However, some of the downwind countries have begun to complain and these countries are demanding that this air quality control mechanism be reviewed. I believe that this re-examination will cause the development of more effective desulfurization technology in the future.

Personally, I believe that a very real need exists to develop technology to remove sulfur prior to combustion. I am aware of some activities in this area that seem to have promise. Examples include the possibility of low Btu gasification in combined cycle applications and processes for treating coal chemically to remove the sulfur prior to the actual use of the coal. I have no doubt that there are many technical developments emerging in this area; which ones will prove commercially viable and environmentally effective is anyone's guess at present.

However, I believe that it is in the best interests of all of us to encourage development of any and all possibilities in this area. The results will certainly benefit the United States since a large portion of our coal reserves contain significant percentages of sulfur content. We simply cannot afford to write off a large portion of our coal reserves because of sulfur content.

Unfortunately, such a technical solution affords no immediate relief to our Midwestern coal industry.

In the meantime, I would urge coal producers who do have the resources to take advantage of the higher sulfur niche in the Western European marketplace to do so.

Thank you.

Prepared Statement of Thomas B. Trumpy

A. Resistance to purchase of U.S. steam coal, or price discounting to compensate for problems, are due to:

1. Port demurrage risk due to: Lack of medium term scheduling by pier operators—principally railroads.
2. Uncertain coal quality due to blending of multiple sources and seams: Size variance; volatile, sulfur, ash variance.
3. Small quantities available in straight coals from single suppliers.
4. High sulfur and ash relative to other suppliers. The sulfur will require blending on arrival or flue gas desulfurization, for either of which European clients lack equipment. Education in use of high sulfur coal in cement kilns and boilers is needed.

B. The following actions are recommended to promote U.S. coal exploitation (and export) and to permit a capacity reserve assuring supply.

1. MINES AND SALES

Encourage cooperative coal sales organizations to permit small processors to cooperate to offer sufficient quantities of standard products for exports (antitrust or act exemption).

Offer tax credits for coal preparation plant (washing, sizing, blending).

Offer tax credits for tipple and loading dock equipment.

Provide government aid in seam surveys and blending program determination to match foreign market requests.

Assist in development of 'on dock' stockpiles of standard grades of coal to handle vessel overage and underage at time of loading.

2. INFRASTRUCTURE

a. Improve and maintain port depths (East Coast, Mobile, New Orleans) if possible for vessels of 48 foot, otherwise 44 foot draft (52+ feet for Pacific Basin traffic).

b. Control loading schedules on a medium term basis (3 weeks to 6 months) and make data available to sellers (firm prepaid dock reservations would support such a system). Loading docks should guarantee (or insure) loading capacity offered.

c. Prepare and equip for vastly increased Mississippi barge traffic and give incentives to investments.

d. Assist in establishment of reserves at ports of and marketing for overage or underage (± 5% is usual charter term) of coal.

e. Provide advantageous bunkering in U.S. ports, if possible outside bar, if depth limited. The Virgin Islands could probably serve a useful role.

3. INDUSTRY

Aid in establishment of industry steam coal grades (ASA or similar) so that reference can be made to certain grades (sulfur, volatile matter, ash fushion, Btu, moisture grades) or that coals can be quoted by reference to norm and variance.

4. LONGER TERM

The government should support developments permitting use of large Mississippi basin reserves of high sulfur and low ash fushion coal: Preparation; efficient flue gas desulfurization; fluidized bed combustion; and gasification.

5. TECHNICAL ASSISTANCE

The United States has extensive experience in the handling and use of higher sulfur, high volatile coals. This experience must be transferred to foreign users before they will buy such coals, because of apparent, but frequently incorrect, perceptions of dangers to their expensive plant and equipment due to: High sulfur (over 2 percent) from corrosion; high volatile (over 28 percent) from explosion of coal dust; and high sulfur and high volatile from spontaneous combustion.

A Remediable Impediment to Export Sales of U.S. Higher Sulfur Coals

The United States has very large reserves of coal with sulfur levels over 1.8 percent, the normal limit for use in power plants without flue gas desulfurization. Because desulfurization equipment is not yet used on power plants in most countries, the cement market appears the most attractive export market for such coal. Such coal has for many years been used in the cement industry in the USA.

A substantial part of this medium or high sulfur coal is found in what is called the "Illinois Basin", covering reserves in Illinois, Indiana and Ohio. Most of this coal is of good quality having a calorific value of well over 11,000 BTU per pound. The mines are generally small, usually surface operations. The coal could be exported either via the Great Lakes or the Mississippi.

Much of the cement industry in Europe is converting from oil to coal at present. In particular the plants in Spain, Italy and Greece, as well as other countries, are located close to ocean ports able to handle imported coal. The quantities of coal required in most cases (vessels under 50,000 Tons) correspond to port capacities and shipment economics from the USA.

The cement process is not disadvantaged by a coal of medium (1.8 to 3.0 percent) or high (up to 6 percent) sulfur content. The raw material for cement is a limestone. When heated in the cement kiln the limestone absorbs substantially all the sulfur in the burning coal. The sulfur does not harm the quality of the cement. Modern horizontal kilns are shorter with vertical preheaters. Higher sulfur coals can cause corrosion in the preheaters, but U.S. cement companies using coal of 3 percent sulfur or more claim to have resolved these problems by regulated air feed and temperature.

Therefore, to the extent that there is a price differential in favor of more than 2 percent sulfur coals, which may be in excess supply in the USA, such coal, used in the cement industry in the USA, could also be sold for export for cement manufacture.

The exportable higher sulfur coal from the USA, particularly from the "Illinois Basin", has over 30 percent volatile matter (often 32 to 36 percent). This causes no impediment to use but does pose handling risks.

Coal is ground to a very fine powder for injection into a power plant burner or cement kiln. This powder is very combustible and may be explosive. The higher the percentage of volatile matter the greater the risk of sudden flash fire. This risk is highest as the dust leaves the grinding mill, where it is warm air dried, or if it is exposed to oxygen or stored for an extended period.

In the case of U.S. electric plants, the risk of explosion is reduced to a very low level by the use of: Well designed and maintained equipment to avoid sparks and leakage (The National Fire Protection Association (NFPA) codes are a model of safety regulation); only inert gases in the powdered coal cycle; "explosion doors" in the powdered fuel handling cycle to permit any combustion to vent harmlessly without spreading the fire, and particularly by; and "direct firing" of coal into the burner as it leaves the grinder so that there is no unnecessary transport or storage of the hot coal dust. (The roller or bowl mills used adjust more easily to variations in the firing feed rate and have far less coal in them exposed to the risk of blow back fires than do the ball-in-drum mills common in Europe.

Unfortunately, such handling techniques are not yet current in Europe. Europe traditionally has used its own coal. This coal has only from 18 to 26 percent volatile matter, so the explosion risk of this coal is lower than for Illinois basin coals. The engineering firms which have been responsible for much of the equipment used to grind coal have therefore designed equipment on a traditional basis for these lower volatile coals, particularly Polish coal: Large rotating drum "ball mills" are used as they are cheaper to build even though more energy intensive and carry large charges of coal; large storage bins ("day bins") are used to store powdered coal, permitting use of a large ball mill operating only part of the time (variation of throughput in such mills is very limited); and hot powdered coal is carried from the grinder to the day bin by the mill air system with cyclone separator and fans.

While this system, exemplified by the engineering of F. L. Smidt of Copenhagen, has an acceptable measure of safety in damp northern Europe with low volatile north European coals, it is "explosively" inadapted to the new and growing use of coal, particularly in the cement industries, in the Mediterranean countries (Spain, Italy, Greece).

Such potential users of coal have been advised that the only margin of safety in these ball mill/storage bin systems in hotter climates comes from the choice of a lower volatile coal (24 to 26 percent volatiles preferred, 29 percent limit). And this, of course, excludes the U.S. suppliers of otherwise well adapted coal.

Some U.S. suppliers of coal are trying to blend coals to meet the ceiling on volatile matter, but this does not eliminate the presence of high volatile particles which could "backfire" on both the suppliers and the reputation of U.S. coal industry.

Is there a solution to this problem? We are advised there is, and that U.S. coal need not be banned from the important export market for the cement industry (over 5 million tons per year for Europe by 1985).

The solutions lie in reengineering European cement plants to direct firing (which is only by-passing the storage bin and is not expensive); avoidance of any storage of dry pulverized coal; safe construction of conveyor tubes and storage bins when they are required (use of "explosion doors" and heavy steel), and use of inert gases in the powdered coal cycle.

These modifications are of very small cost (under $100,000 for a large plant) compared to the cost and security benefit to coal users to be able to include another source, U.S. coal, in their purchasing.

In the course of a series of studies prepared with F. R. Schwab & Associates, experts on the coal industry, we determined that lower sulfur coal will be in heavy demand by the middle of this decade (largely as coal use increases before desulfurization equipped electric power plants are commissioned abroad).

The U.S. has a substantial and efficient mining industry with large exportable reserves of medium and higher sulfur coal. This coal can have an important export market if the U.S. government, the coal industry and equipment manufacturers[1] encourage the foreign cement industry to install equipment able to use a broad range of fuels, including U.S. high volatile coal.

We would be happy to answer any questions on the subject of this note.

Coal Weighing and Testing for World Thermal Coal Trade

Coal is sold on the basis of weight and technical characteristics.

I. The principal technical characteristics are:

Calorific value (BTU per pound or kilo calories per kilogram).

Percentage inert matter (total weight less fixed carbon and volatile matter). Principally Ash and Moisture.

As the water has to be removed before burning (drying and grinding) or is driven off in burning it is not merely inert but absorbs part of the calorific value. The net calorific value (PCI or lower calorific value) is the calorific value after heat used to drive off all moisture (roughly 4 percent of gross calorific value for coal with under 10 percent humidity).

Other characteristics affecting the handling, burning or ash utilization properties of coal. For example, Ash composition, fusion temperature, Hardgrove grindability index, Free swelling index (coking properties), trace elements (sulfur, chlorine); sizing (minimum and maximum), volatile matter.

See note on Technical Specification of Coal for further details.

Most of the attention of the technical bodies, institutes and associations concerned with coal specifications have devoted their efforts to:

Problems of metallurgical coal for metallurgical use (as such coal has been the largest part of coal moving in international commerce in the past.

Classical definition of coals by "rank," a system defining coals by their geological order from anthracite (the highest percentage of carbon), passing by bituminous coals through lignite to peat at the other end of the scale.

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[1] The technical information in this article is derived from information made available by Combustion Engineering-Raymond.

Note: The author wishes to thank Messrs. Larry Morton and Bill Converse of Combustion Engineering Europe, Paris; Mr. Zachariah Allen of F. R. Schwab & Associates, New York; and Mr. Richard Sommer of New Canaan, Connecticut, for their contributions to this note.

Such letter studies are of abstract utility in comparing reserves of coals of different classes in different geographic and geological locations, but are far too general to assist in creating commercial standards for the developing world trade in thermal coal.

Such studies do not lead to the definition of "types" of coals which would have similar burning characteristics. In fact a detailed review of present international research by public and private organizations has led to the conclusion that such standards do not exist and probably cannot exist, at least for unwashed thermal coals.

Within a general type of coal (calorific value; volatile matter, ash and moisture percentages, fusion temperatures, and percentage of sulfur) substantial differences in burning characteristics in specific burning units arise because of the chemical characteristics of the ash. Any variation of any of the basic characteristics also can change such burning characteristics and effective heat output. Any blend of one coal even with another "similar" coal can result in substantial differences in burning characteristics.

Coal therefore is not fungible; it is not a commodity.

We are informed that the burning properties of any coal or blend in any burner can be predicted through a complete petrographic analysis and some testing. Such methods are only beginning now to be offered commercially on a substantial scale.

This will not solve the problems of the determination of the relative economic values of particular variations in coal specifications for particular users. Such scientific testing and matching is, however, a useful and welcome initiative in the scientific analysis and testing of coal for commercial purposes.

II. Coal is sampled and weighed at a point where it is being handled, usually at the point of transfer of title.

The method of sampling coal can affect significantly the specifications as tested. In particular different parts of a load of coal will normally vary in

Moisture.—concentrated in finer material and at the bottom except during or just after rain or snow.

Size.—smaller particles tend to settle to the bottom of a vehicle or belt due to vibration.

Ash.—heavier stones tend to work to the bottom particularly on a moving belt.

Sulfur.—where more concentrated in ash (pyritic sulfur) than in the coal (organic sulfur) it will follow ash concentrations.

Volatile Matter and pure coal carbon will tend to move to top if ash and wet fines work to bottom.

Therefore any sampling method except across flow (sample taken where coal falls free from a belt) sample will tend to exaggerate top or bottom characteristics even if a homogeneous product is being tested (which is alas not always the case).

Unfortunately many operating coal terminals are not equipped for representative sampling.

The result is that even a major sampling firm confirms:

"In practice sampling can only be performed at a certain place which not always is the best place. In Rotterdam e.g. one is not allowed to sample in the hold of a vessel. There are no conveyor belt systems so most sampling has to be done from a barge or a stockpile.

"The same coal is e.g. in Australia sampled by an automatic system or in the USA at Hampton Roads from the top of a railway car.

"Especially the coal analysis of the coal sampled at Hampton Roads is often different from the same coal sampled at e.g. Rotterdam and/or the power station.

"Contractually one can not lay down a certain specified sampling method without considering the practical possibilities of the ports concerned."

We find this situation very undesirable and look forward to efforts to correct it.

III. The actual weighing of coal is similarly done by several different methods each of which has elements which can introduce commercially significant errors.

Belt weighing: depends on consistency of load on belt.

Rail car and truck weighing: depends on accuracy of stated empty weight of wagon and whether stuck or frozen coal remains.

Grab weighing: depends on how operator maneuvers crane and whether coal is stuck on crane.

Hopper weighing: depends on sensitivity to inflows and outflows.

While the errors in each of these systems is considered small, the difference of several thousand dollars between the weight on loading and unloading will justify more well designed systems.

IV. The ultimate commercial question is to assure that the product loaded at one point will test the same weight, specifications and commercial value at another point (port of arrival or user's installation) so that the commercial difference is negligible.

Ideally a seller and a buyer should be able to provide by contract terms for sampling and testing which will permit such identical results. Such is the aim of such groups as the British Standards Institute and the ASTM (American Society for the Testing of Materials). Yet each has a number of standards which permit significant variations in sampling which vitiate the precise standards for testing.

In the words of one of the world's leading minerals sampling and testing companies:

"We would suggest therefore that in addition to stipulating the standard you also stipulate those portions of the respective standards required to achieve the precision you want."

V. We consider the resolution of the vagaries of sampling and testing methods, variances of over 0.1 percent in the tested value, and allowable variances within a load of coal, as well as the establishment of user-cost related penalties and premia for variances from contract specifications to be essential to the orderly development of international trade in coal. We hope to contribute to the resolution of these problems through their continuing analysis.

PROJECT ASSISTANCE INTERNATIONAL,
EUROPEAN HEADQUARTERS,
Paris, France, February 27, 1981.

Mr. J. WALLACE HOPKINS,
International Energy Agency,
Paris Cedex 16

DEAR WALLY: In some client work I am doing on my own I have encountered several issues which pose impediments to free and expanded trade in coal. I want to know what you are doing and whether there is some basis on which we could help resolve these problems.

1. STANDARDS FOR CLASSIFICATION OF COAL

I have met with and spoken to the U.N. and the IEA Research people to see what exists. It appears that work was dropped in the 1960s. (Bureaucratic lag on the diminishing role of coal, I suppose). Most of the work is abstract and geological, and oriented to met. It does not get into the huge range of bituminous coals for thermal use.

What is needed is an analysis of bituminous coals from the user viewpoint:

How does one fingerprint the coal one is buying to avoid substitutions; how does one fingerprint coal in a manner which will permit analysis of burning characteristics given the parameters of particular powerplants, and which will permit blending programs as for metallurgical coal; and how does one define the shortfall in final thermal output for certain variations in the fingerprint of a coal.

Coal is still being purchased with very rough specifications. So long as coal was cheap a variation of several per cent in thermal output of a coal plant was not worth the effort to control it. Coal is no longer cheap. Yet scientific blends of coal practically do not exist.

My layman's understanding is that through precise petrographic fingerprinting of coal, the above points can be resolved. Until they are resolved, the aleatory aspect of international coal trade is discouragingly large. Major buyers specify coal to a mine and vein, but should that coal be unavailable (strike or accident) or should the ash chemistry change further in a mine, the measure of damages or cancellation point cannot now be specified.

This is a technical question, but one which is also relevant to establishing contractual predictability for international coal trade with particular reference to areas with many coals or which will supply coals blended or for blending.

RESPONSES TO WRITTEN QUESTIONS SUBMITTED TO MR. TRUMPY BY SENATOR PERCY

Question 1. Mr. Trumpy, yours is the only testimony which touches on the special handling impediments which confront Illinois Basin coal, due to its high "volatile matter" content. You state that higher-sulfur, higher-volatile coals will only be marketable in European industries when those industries have installed equipment able to utilize these coals without risk. To what extent can the installation of suitable "grinding mills" to burn higher-volatile coals be expected to occur on its own? What can American government officials or private enterprise do to expedite this transition to preferable industrial equipment?

Answer. High volatiles:

Many users, particularly utilities, use direct firing systems and vertical roller or bowl mills (e.g. C. E. Raymond). They have no problem with high volatiles because there is very little hot coal dust in the circuit. Use of high sulfur coal in utilities is, however, limited.

Many users, particularly cement companies (which already use ball mills for crushing clinker) use the same type of mills for grinding coal.

These mills can have up to 25 Tonnes of coal in the grinding circuit at any time.

These mills have a poorer "turndown" rate than vertical mills and intermediate storage bins for 30 to 600 Tonnes of powdered coal are used.

The comparative advantages of the two systems are hotly disputed by users and manufacturers. I do not see one type driving out the other.

However, all users of coal recognize that powdered coal is dangerous, and most users are installing inerting gas (CO_2 or Nitrogen) systems for mills and powdered coal storage. Such inert gas systems reduce explosion risk and permit use of higher volatile coals.

Use of inerting systems in conjunction with all use of powdered (nonstoker, nonmetallurgical) coal should be encouraged or mandated as a measure of employee safety. The costs are not that heavy, the need is real, and if user countries could be encouraged to require inert gas systems in powdered coal grinding and handling, it will substantially reduce or eliminate this impediment to use of Illinois basin coals.

Question 2. You have expressed concerns about the U.S. coal industry's readiness to undertake successful "blending" of high-sulfur Midwest with lower-sulfur Western coals. Please describe the problems you have with blending, as it is commonly understood.

Answer. Blending for export would have to be with lower sulfur coals of good calorific content. Blending will probably be with very low sulfur (under 0.8 percent) foreign coals. US Central Western coals are not of sufficient quality (energy content) to justify transport or blending.

The details of blending problems exceed my technical competence, but have to do with modified or irregular burning characteristics (flame length, height and shape, and ash fusion characteristics) which can result from blending coals.

Most blending is not blending but rough mixing. This accentuates the irregularity of burning characteristics.

I believe Dr. Barry in Pittsburgh is considered knowledgeable on these problems.

Question 3. As an American living in Europe as a coal consultant, what do you see for the future of European research into new technologies to burn higher-sulfur coals directly? Are European emissions restrictions likely to be adjusted in the coming years, so as to allow for increased direct utilization of higher-sulfur coals?

Answer. a. There is little or no research directed to the use of high sulfur coals. Some research on gasification and fluidized bed combustion will permit use of high sulfur coal, if it is available at no economic disadvantage.

Research is being conducted into the total economics of coal use (Bergbau Forschung, Essen, Germany) including the economics of use and recovery of all ash and ash constituents including sulfur. I do not know the present state of such research.

The future world demand and price for sulfur will be of great importance in permitting economic justification of sulfur recapture in gasification or desulfurization plants. Sulfur use should be investigated and encouraged as a first step.

b. Regrettably, European standards (except in Italy) are tending to more strict limits on levels of sulfur in coals to be used without or with desulfurization. Many countries in Northern Europe are being encouraged to adopt a 0.8 percent sulfur limit.

The whole question of sulfur and sulfur dioxide has been blown up totally out of proportion in Europe as in the USA. Clearly the automobile industry prefers to keep the public worrying about sulfur not NOX.

The change to input (percent of sulfur in fuel burned) limits from emission limits in Northern Europe is so marked, however, that I begin to suspect possible lobbying supported by those low sulfur coal producers with the most to gain (South Africa, Australia, Canada, Colombia) and by the oil multinationals which control their coal production. I would like to discuss this subject further in October after I pursue my investigation.

Question 4. Do you believe that the lack of federal specification standards for coal quality, like those which are in place for grain, in any way encourage foreign buyer uncertainty in American coal supplies? Would you favor creation of federal coal specification standards to increase buyer confidence in American coal?

Answer. The Germans have a DIN standard for almost everything, including liquid fuels. They have not yet been able to develop a DIN for even their coal!

I regret, but I see the quest for coal specification standards, particularly for steam coal, as a yet unrealistic hope. The coal on a MAF (Moisture Ash Free) basis is easy to classify, but it is sold with the ash, and that is the problem.

Even detailed standards will not make different coals more similar.

PREPARED STATEMENT OF EDWARD J. BENTZ, JR.

IDENTIFICATION OF EMERGING MARKETS

Emerging markets for interior high sulfur coals:

Domestic.—Synthetic fuels industry (e.g. coal-sourced methanol); industrial and feedstock industry uses; and blending stocks for utility usage.

Export.—Synthetic fuels; industrial uses (e.g. cement industry).

FACTORS, TRENDS, AND UNCERTAINTIES AFFECTING U.S. COAL MARKETS (DOMESTIC AND EXPORT)

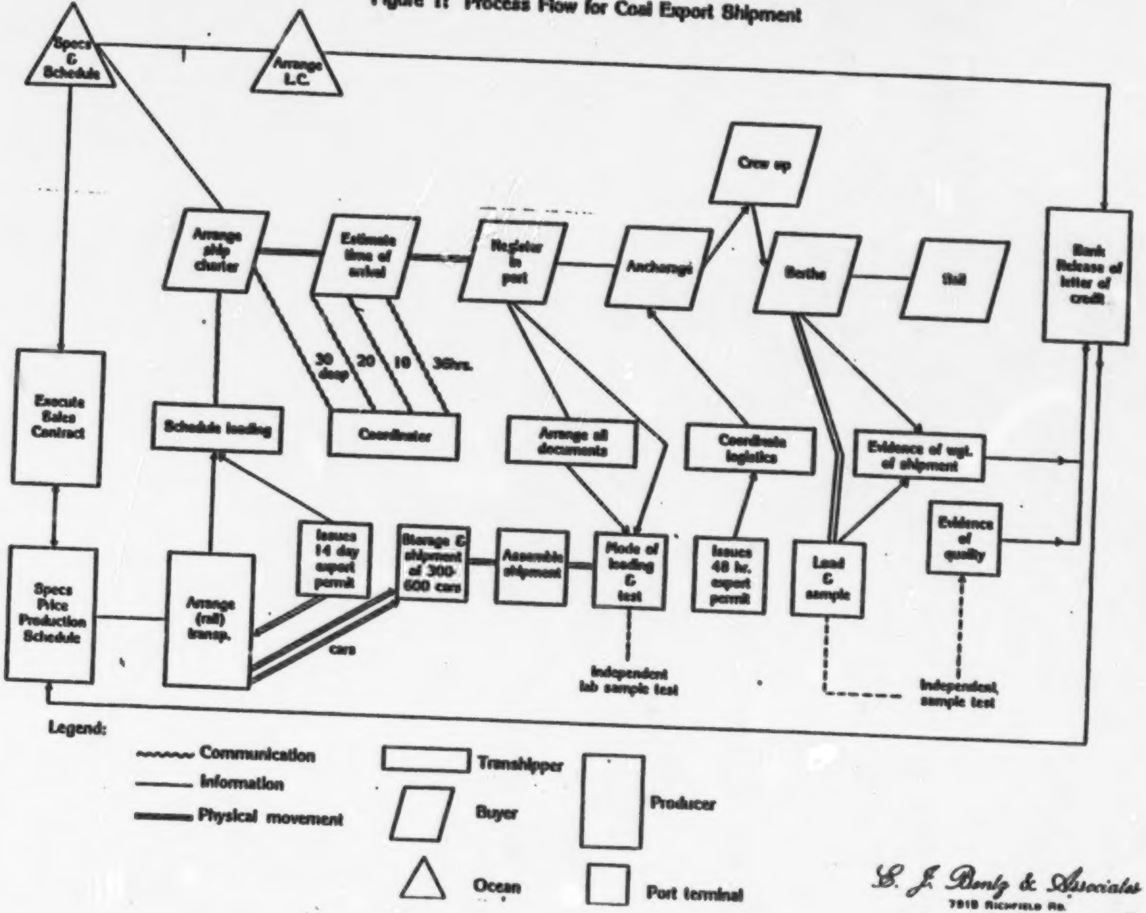
Overall market competitiveness

Final competitiveness of U.S. coal is determined on the delivered price of coal and coal-sourced fuel products in the marketplace in a supply-secure and reliable fashion.

Price and supply security are affected by each element in the coal sale chain, and upon changes—many of them external—on each segment of the chain.

E.g.: Coal Export shipping chain (figure 1). Here, the price buildup consists of: Purchase price at the mine; rail freight rate/inland marine transport; rail demurrage; terminal transfer charge; ocean freight rate; ship demurrage; terminal unloading; export or import taxes; inventory costs; commissions to brokers and agents; and cost associated with risk/reliability imbedded in the purchase contract.

Figure 1: Process Flow for Coal Export Shipment


Specs & Schedule
Arrange L.C.
Crew up
Arrange ship charter
Estimate time of arrival
Register in port
Anchorage
Berths
Sail
Bank Release of letter of credit
30 days
20
10
36hrs.
Execute Sales Contract
Schedule loading
Coordinator
Arrange all documents
Coordinate logistics
Evidence of wgt. of shipment
Issues 14 day export permit
Storage & shipment of 300-600 cars
Assemble shipment
Mode of loading & test
Issues 48 hr. export permit
Load & sample
Evidence of quality
Specs Price Production Schedule
Arrange (rail) transp.
cars
Independent lab sample test
Independent sample test
Legend:
Communication
Information
Physical movement
Transhipper
Buyer
Producer
Ocean
Port terminal

Of particular significance are: Price escalation in inland transportation rates; demurrage fees created by lack of port-related coal handling, dumping, and ground storage capabilities; and adequacy and enforcement of contracted coal standards.

Market characteristics

Markets are of mixed nature:

Regulations.—Export market not regulated; domestic utilities are regulated; and product markets (synthetic fuels) are subject to varying degrees of regulation.

Contract basis.—Historic "met" export—well-established, long-term; current and projected domestic utility markets are long-term contract with supplemental spot buying to fill margin; and emerging longer-term export steam markets with greater uniformity and acceptance of "coal specs," as well as greater end-use segmentation; potential futures markets.

High sulfur market characteristics

Supply, price and transportation advantages:

Supply price.—H. S. coal supply markets will enjoy comparative mine price advantage reflecting abundance of interior high sulfur coal deposits and limited competition for use.

Transportation, access and cost.—Interior supply region enjoys locational comparative cost advantage by water and rail to markets:

Gulf Coast Export Terminals; Gulf Coast Synthetic Fuel Plant Sites; Interior Industrial and Synthetic Fuel Plant Sites; and Great Lakes Ports and Markets.

Trends in H.S. coal market growth and evolution

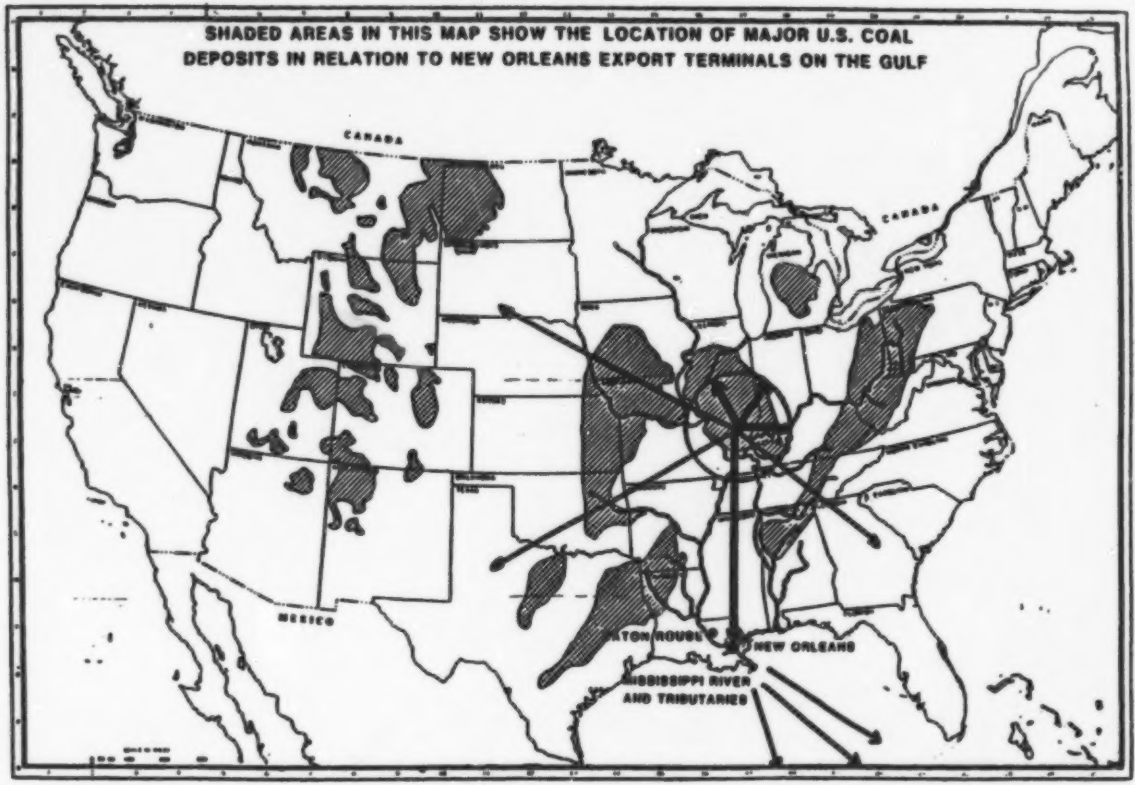
Growth trends (figure 2):

Domestic synfuel markets will locate in interior and Gulf within transportation cost radius of coal supply and product markets and product pipelines; will develop in post '85 period. These markets can account for a significant amount of the total high sulfur production, and contribute to displacement of foreign oil (e.g., coal-sourced methanol has been projected to account for displacing 120 million barrels of gasoline by 2000).

Export markets will focus on industrial uses, such as cement industry needs; market needs are emerging today based on on-going industrial conversions in Europe. (E.g., French cement industry will be increasing its consumption of coal to 2 million tons by 1990).

Market evolution trends.—Will in part depend upon piggybacking quick-growing, yet fluctuating export markets with slower growing domestic, steady domestic markets during transition period. High sulfur markets will also "capture" infrastructure investments being made for low sulfur coal exports—especially transportation, port, and coal handling and ground storage capacity in the Gulf.

Figure 2: Inter-regional and Export Transport of Interior Region High Sulfur Coal to Emerging Market Locations


SHADED AREAS IN THIS MAP SHOW THE LOCATION OF MAJOR U.S. COAL DEPOSITS IN RELATION TO NEW ORLEANS EXPORT TERMINALS ON THE GULF
CANADA
CANADA
MEXICO
BATON ROUGE
NEW ORLEANS
MISSISSIPPI RIVER AND TRIBUTARIES

Overall uncertainties in the markets for coal (domestic and foreign)

Overall world economic growth and coal demand (energy mix).

Political stability in both coal and oil producing supply nations (oil interruptions, coal strikes . . .)

Foreign buyer supply diversification strategies and subsequent price volume relationships.

Domestic infrastructure: Transport rates; transport capacity and congestion; port capacity; and assembly and handling capacity.

Domestic rate of synfuel development.

Domestic market energy mix and industrial conversions.

Regulatory environment and government role.

GOVERNMENT ROLE AND POTENTIAL ACTION AGENDA

To facilitate and catalyze the development of the high sulfur coal market.

Removal of regulatory bottlenecks across the field chain—in the production, movement, and usage of coal and coal-sourced fuels, e.g.: Expediting multi-layer site permitting requirements for coal development; providing clear-cut and timely guidance on fuels registration/certification procedures for coal-sourced synfuels; and expediting, consolidating and selective transfer of public investment port improvement requirements to local jurisdictions.

Spur existing market forces and competition leading to enhance trade potential and favorable trade balances.

Foster development of uniformly accepted "coal specs" so as to facilitate buyer anxieties and subsequent long-term contracts (e.g., U.S. export grain standards).

Foster greater market liquidity and trading of small producers (e.g., commodity futures markets).

Develop bilateral and multi-lateral coal agreements that in turn would foster supply security and create an environment for private investment in cost-saving technologies and operations (e.g., investment in ground storage and handling facilities; more efficient vessel designs and sizes; utilization of "back-hauls" on ocean voyages).

Provide and exchange information that would reduce and "bracket" uncertainties.

Example: Comparative characteristics

Coal export system:	Grain export system:
Great productive capacity, resources, and productivity.	Same.
Large number of mines, increasing concentration, decreasing number coal miners.	Decline in number of farms, decrease in farm population, increase in farm size.
Coal export facilities owned/operated by carriers.	Grain export facilities owned / operated / leased by producers/grain traders.
Steam coal peak surges, and port congestion.	Has experienced peak congestion, but has managed long-term growth with high efficiencies.
Limited inland stockpile and assembly areas.	Well-developed, inland terminals and country elevators.
Emerging private investment in export facilities.	Continued growth in private investment in export port facilities.
No federal standards----------------------	Federal role in establishment and administration of grain standards for quality and weight.
Inland transportation concerns of adequacy of service, car needs, and congestion.	Same concerns, however, in general the transport system has responded to peak demands.

Develop, enhance, and maintain a strong transportation-port infrastructure capable of servicing emerging trade demands and national security needs

Development of a coal-flow emergency-preparedness logistical plan for coal movement and storage in event of petroleum supply interruptions in U.S. or trade partners.

Develop and maintain a strong merchant marine capability—both skilled manpower and know-how; as well as vessel needs.

Foster productivity gains and capacity upgrading along inland transportation routes (e.g., creating incentives for improvements in rail efficiencies by providing for greater rate-making freedom and contract rate provisions pursuant to the Staggers Act).

Facilitate the development of innovative public-private financing for cost-effective and environmentally sound improvements in public right-of-way (channel dredging and deepening, harbor improvements).

SUMMARY

There exists emerging domestic and international markets for high sulfur interior coal. These markets include coal-sourced synfuel industries and industrial conversions (like the cement industry).

Essential to the realization of these markets is the ability to deliver coal in a price competitive and supply-secure fashion.

Key determinants of price competitiveness and supply-security are: The development of competitively priced transportation and port coal-handling infrastructure; and the reduction, consolidation, and selective removal of regulatory bottlenecks to the production, movement, and usage of coal and coal-sourced fuels.

Government can play a key role in both a nation-to-nation basis in creating an environment for supply-secure long-term export coal contract commitments, as well as removing regulatory and institutional barriers to expanded private investment for both domestic and export markets. An example is the successful U.S. export grain trade.

SOURCES

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2. "Coal Export Markets: Patterns and Trends," Dr. Edward J. Bentz, Jr., presented to Energy Bureau Conference, Arlington, Virginia, March 3, 1981.

3. "Alternative Energy Sources, Part B: Transportation and Energy Outlook to 2000," Dr. Edward J. Bentz, Jr., Academic Press, March 1981.

4. "Proceeding of United Nations Symposium on World Coal Prospects; U.S. Transportation and Energy Through 2000: The Future Role of U.S. Coal—Changing Patterns of Supply, Demand, and Movement," Dr. Edward J. Bentz, Jr., Mr. J. Gutnam, and Mr. L. Kahn, October 1979.

5. "Synthetic Fuels Technology Overview, With Health and Environmental Impacts," Dr. Edward J. Bentz, Jr., Dr. Eliahu J. Salmon, Ann Arbor Press, April 1981.

6. "Factors that Affect the U.S. Market Demand and Utilization of Methanol-From-Coal, Within the Transportation Sector," prepared for the U.S. National Alcohol Fuels Commission by E. J. Bentz & Associates, Inc., October 1980.

7. "Selected Technical and Economic Comparisons of Synfuel Options," prepared for the U.S. Congress, Office of Technology Assessment, by E. J. Bentz & Associates, Inc., submitted April 1981.

8. "Outlook for Alcohol Fuel Markets," Dr. Edward J. Bentz, Jr., presented to McGraw-Hill Conference, Chicago, Illinois, May 7, 1981.

Representative SIMON. I regret to say we're at the point where we will have to conclude the hearing.

The luncheon will follow immediately, and at 1:50, the High Sulfur Coal Export Conference—we are in a combination of the field hearing and the conference—will commence. This concludes the field hearing and the hearing is adjourned.

[Whereupon the subcommittee adjourned subject to the call of the Chair.]

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

UNIVERSITY OF WISCONSIN-MADISON,
DEPARTMENT OF METALLURGICAL AND MINERAL ENGINEERING,
Madison, Wis., June 9, 1981.

Re: U.S. Senate Field Hearing on "Factors Affecting the International Utilization of High Sulfur Coal", June 8, 1981 at Carbondale, Ill.

Hon. CHARLES H. PERCY,
Chairman, Subcommittee on Energy, Nuclear Proliferation, and Government Processes, Committee on Governmental Affairs, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: The Subcommittee hearings on export of high-sulfur coal brought attention to three barriers. Those perceived problem areas are: supply reliability; transportation infrastructure; technology for environmentally sound use of high-sulfur coal.

The purpose of this letter, for the record, is to point out that a technology exists for sulfur dioxide emissions control which can cause the sulfur content coal to be viewed as a resource rather than a liability. Furthermore, that technology was conceived and developed in Illinois.

The technology in question is called the Pircon-Peck Process. It was developed at Illinois Institute of Technology by Ladd J. Pircon and Prof. Ralph Peck. Briefly stated it operates by absorbing the SO_2 gases in a liquid containing ammonium salts which in turn reacts with phosphate minerals to produce directly from the action of the SO_2 gas ammonium phosphate fertilizer. The process embodies two important inventions which combine to produce a unique result. Those advantages are: (1) a design of the flow pattern for the liquids and gases which causes exceptionally high mixing efficiency; (2) an unusual chemical reaction which allows what had been considered a difficult approach to transform the phosphate mineral to ammonium phosphate fertilizer via the action of the SO_2 from the gas stream.

The reason that we at the University of Wisconsin have become familiar with the process stems from our research into alternatives for the disposal of pyritic tailings from the mining and processing of metallic sulfide ores. After learning that a process (Pircon-Peck) had been developed to remove SO_2 from coal burning effluents in a potentially profitable manner (i.e. not a typical "throwaway" fluegas desulfurization process) we investigated whether the process might be applied to the removal of SO_2 from gases created in the smelting of sulfide ores. We were pleased to find that the process could be even more profitable for smelters because in sulfide ore smelting the chemical reaction is essentially a burning of material with up to 30 percent sulfur. Furthermore, the process would also be attractive to the cleanup of smelter "tail gases" which result if the smelter plant has used the rich SO_2 stream from the ore burning to generate some other byproducts, e.g. sulfuric acid (Note: the "tail gases" are in the same range of SO_2 content as the medium to high sulfur coal burning effluents).

It is somewhat enigmatic to us that the Pircon-Peck process is not being vigorously pursued as a remedy for the environmental problems of burning high sulfur coal. Perhaps it is because of the capital investment associated with a Pircon-Peck type plant. As our own evaluation of the process showed (copy enclosed) although Pircon-Peck capital costs are higher than throwaway scrubber systems for coal burning SO_2 control there can be no comparison in final analysis between a profitable byproduct (fertilizer) and a costly solid waste disposal problem (typical of the throwaway systems).

Perhaps the difficulty in adopting the process lies in technical concerns. For example, there are technical questions that can be raised about the quality of the fertilizer—especially if it were produced from smelters. Those questions have been of special interest to us and happily, we think again a potential problem turns into another opportunity. The problem is how to remove residual elements, e.g. uranium, copper, lead, zinc, selenium, molybdenum, mercury, etc., which may be present in the gas stream and if retained in the fertilizer may be deleterious to plant or animal life. Here the Pircon-Peck process has an advantage in that a liquid fertilizer stream can be produced which can be treated by a procedure known as continuous ion exchange (CIX). By using CIX it is possible to remove a number of elements from the fertilizer stream in a manner similar to the way water is treated by passing it through an activated charcoal filter.

Furthermore, if those residual elements have any intrinsic value the CIX process allows them to be separated, collected and concentrated using hydrometallurgical technology. Thus, the problem of fertilizer residuals may be turned into a desired adjunct operation to retrieve those materials for their own value. This area deserves special consideration as a source of recovery of strategic materials from a source (flue gases) which would otherwise be considered too dispersed for practical recovery.

In summary it seems that any discussion of problems of high sulfur coal export should begin by considering an attractive technology such as the Pircon-Peck which makes the coal increase in value in proportion to its sulfur content. It may even make high sulfur coal attractive enough to be used in Illinois, or other parts of the U.S. on a regular basis.

If there is any further information desired please feel free to contact us.

Sincerely,

JAMES A. CLUM,
Assistant Professor, Metallurgical Engineering and UW Extension.
WESLEY W. WEIDEMANN,
Director, Mining Research Project.

Enclosure.

[From a Report to Upper Great Lakes Regional Commission]

PRODUCTION OF FERTILIZER FROM FLUE GAS DESULPHURIZER

BACKGROUND

Sulphur in combustion gases has been a problem ever since the start of the industrial age. Efforts to chemically control sulphur emissions date back at least 100 years. Theoretically the most expedient method of control of sulphur oxide emissions is to remove sulphur from the fuel since it is much more concentrated in the fuel when compared to flue gas. However, because of the time scale and financial requirements to fully develop and deploy such a technology, emission prevention has been relegated to a secondary role.

During the last 10 years there have been major efforts toward sulphur abatement through means of flue gas desulphurization. Since 1973 the U.S. Patent Office has been allowing about one patent per day related to this field. The research and technical literature is equally confusing. Chemical Abstracts excerpts some 15 abatement related articles per day. A critical review shows that much of the recent activity has been devoted to solving engineering problems. It is often difficult to recognize the novelty of inventions because of the number of combinations of basic processes combined with regeneration reactions. A consultant's report listed over 140 different named processes which may be commercially adopted during the 1980's and 1990's. Other available processes were not mentioned and still more are being developed daily.

There are a number of different methods of classifying processes for sulphur control, but for purposes of this evaluation, processes can basically be broken into "throwaway" and "recovery" types. A throwaway process recovers flue gas sulphur in the form of a sulphur salt which is discarded in either a wet or dry form. Most present day power plant scrubbers are the throwaway type using calcium basic chemistry with limestone or lime the source of calcium. The recovery type of process produces sulphur in a marketable form. The most common present day recovery processes recover sulphuric acid. Other processes recover sulphuric acid. Other processes recover elemental sulphur, ammonium sulphate fertilizer, ammonium phosphate fertilizer and other products.

The main drawback of the throwaway processes are the problems associated with disposing of the wastes which are in the form of sludges, powders or solids, depending on the particular process employed. Disadvantages of the recovery processes include the requirement of a ready market for the product and the higher expenses involved in processes which are often chemically and thermodynamically inefficient.

THE PIRCON-PECK PROCESS

One of the recovery type of processes which is showing significant promise is the Pircon-Peck process. This process is based on phosphate chemistry and produces ammonium phosphate fertilizer as an end product. The phosphate chemistry has been married to a particularly efficient engineering design to result in a process which is comparatively energy efficient and therefore potentially less costly to operate.

POWER PLANT APPLICATIONS

Comparisons of costs and benefits of using the Pircon-Peck process in Wisconsin are not completely straightforward because there are alternative methods of complying with clean air standards. In Wisconsin, utilities have chosen to meet emission standards by burning low sulphur western coal and avoiding the use of scrubbers. Low sulphur western coal generally contains less heat per pound than does high sulphur Illinois coal and it is generally more expensive per BTU in the North Central Region of the country. The Pircon-Peck process can be used on a power plant burning low sulphur western coal, however economic rationality would dictate that if the Pircon-Peck process were employed that cheaper (in most areas) high sulphur coal should be burned. If high sulphur coal is used in addition to the Pircon-Peck process there are alternative methods of remaining in compliance with air quality standards. Therefore we will make general comparisons of using high sulphur coal versus low sulphur coal as well as comparisons of alternative methods of scrubbing when high sulphur coal is used.

The amount of coal which would be burned in a 500mw power plant per year depends on a number of factors including plant design, load factor, and type of coal burned. For purpose of comparison we will assume such a plant would require 2,200,000 tons per year of high sulphur coal or 2,600,000 tons of low sulphur coal. The reason for this difference is that high sulphur coal contains 22.11×10^6 BTU per ton and low sulphur coal contains 18.65×10^6 BTU per ton. The average price in the East North Central Region for high sulphur coal is $28.35 per ton and for low sulphur coal the price is $32.24 per ton. Thus a 500mw plant burning high sulphur coal would be expected to pay about $62 million per year for coal. The same plant burning low sulphur coal would be expected to pay about $84 million per year. Thus a hypothetical 500mw plant might be expected to save $22 million per year in fuel costs by burning high sulphur coal. The actual amount saved would depend on location, rail connections, plant efficiency and other site specific factors.

Power plants in the planning stage in Wisconsin have all chosen to meet air quality standards by burning more expensive low sulphur western coal instead of using cheaper high sulphur coal and using a scrubber. Part of the reason for this decision is said to be because of problems with waste disposal associated with a throwaway scrubber process. However companies have generally found compliance with emission standards to be cheaper in their selected course of action.

Examination of the economics using high sulphur coal with several different scrubber technologies indicates potential advantages for the Pircon Peck process.

The chemical process was developed by Ladd J. Pircon at the Illinois Institute of Technology where it was developed to the pilot plant scale. Pircon also developed the reactors used in the process. The reactors are presently being used with calcium based chemistry for pollution control at a number of sites in the U.S.

The combined reactor/phosphate chemistry of the Pircon Peck process has been proposed on a demonstration scale at a 100mw coal fired power plant in southern Illinois and at a 600mw plant in West Virginia. No grants have yet been made to allow contracts to be let and construction to begin. The process also has potential to be used for sulphur abatement on nonferrous metal smetlers, but to date no experimental work has been formally proposed.

FERTILIZER PRODUCTION

The basic chemical process involves reaction of flue gas sulphur dioxide with ammonia gas and phosphate rock to produce diammonium phosphate fertilizer and calcium sulfate. Calcium sulphate can be separated and disposed or it can be included in the fertilizer. If included with the fertilizer the material is similar to superphosphate fertilizers. Soils in the North Central States are often sulphur deficient so there are potential benefits from leaving the material in the fertilizer mix for use in that area of the country.

STRATEGIC METAL RECOVERY

Trace element contamination of the fertilizer is potentially a problem. However a few design modifications involving a series of ion exchanges has been tested which removes the trace elements in concentrated form to be sold as a frit or disposed of as necessary. Trace elements would be present as the result of vaporization of constituents of coal ash or metal ores. Thus the particular elements present depends on the composition of the original coal or metal ore. Some of the recoverable elements which are of interest include copper, manganese, boron, zinc, molybdenum, aluminum, titanium, chromium, cobalt, nickel and magnesium. Estimates of the cost of recovering these elements have not been made, however the technology is simple and the costs are not anticipated to be excessive.

An ion exchange system which has been tested with the Pircon Peck process is the pulse type system known as Chem-Seps. A rough cost estimate for such a system on a commercial scale would be $2,100,000 (1978 dollars), of which about 2 percent is resin cost.

The system cost would increase as:

(a) The number of elements to be recovered increases (a nearly linear direct correlation);

(b) The concentration of the element to be recovered decreases.

It should be noted here that the special characteristics of the Pircon reactor result in a very low L/G (liquid to gas) ratio. Consequently, all of the equipment needed for handling reactor liquids can be scaled down. That lowers capital and operating costs (and energy). Furthermore, the relatively low liquid volumes from the reactor allow for more efficient operation of ion-exchange equipment (low total volume/higher relative concentration).

EFFICIENCY OF OPERATION

The Pircon Peck process seems to be efficiently engineered to remove flue gas sulphur. At the pilot plant efficiency of recovery was over 97%. It is uncertain that this level of efficiency can be maintained in a large scale installation. However, there is no reason to anticipate a drop in efficiency since the reactor has already seen extensive commercial use. As a base for comparison, a wet limestone scrubber normally removes about 85% of the sulphur. In the Pircon Peck process there is an economic incentive to maintain high efficiencies in removing effluent sulphur since fertilizer production is directly proportional to the amount of sulphur recovered.

COST OF OPERATION

Cost of building and operating a Pircon Peck reactor compared with other methods of controlling sulphur emissions are difficult to accurately assess. Costs depend strongly on the types of process selected for comparison, the sulphur content of the fuel, the waste (or product) produced and its mode of disposal. The yardstick with which other processes are compared is the throwaway line or limestone slurry process.

The cost of scrubbing low sulphur coal is lower per megawatt than high sulphur coal. However high sulphur coal is generally cheaper per BTU. In the case of a recovery process, revenues from marketing of sulphur products are higher from high sulphur coal because of larger amounts of sulphur present. Estimates of cost of constructing and operating the Pircon Peck process are less firm than estimates for other processes because the engineering work has not progressed as far.

Furthermore, comparable operating costs are not available to allow comparison of the Pircon Peck process with other processes. Figures available for other processed detail only the cost of controlling SO_x emission. Figures available for the Pircon Peck process are estimates of the cost of controlling SO_x emissions and cost of manufacturing fertilizer.

Comparison of operating costs shows that as the sulphur content of the fuel increases the cost of operating any scrubber system increases. In the throwaway scrubber systems this is just an increased cost of operation. However in recovery scrubber systems the volume and therefore the value of the end product also increases offsetting part or all of the increased operating cost. Since the Pircon Peck process has low energy requirements its cost of operation should not increase as rapidly as other processes. In fact estimates have shown a net profit from fertilizer production. Increasing the sulphur content of the fuel could be expected to increase operating profits from sulphur recovery.

TABLE 1.—CAPITAL AND OPERATING COSTS FOR A 500-MW PLANT FOR SO_x CONTROL BURNING HIGH-SULFUR COAL

	Limestone slurry[1]	Wellman-Lord[1]	Saarberg-Holter[1]	Pircon-Peck[2]
Capital costs: Total capital cost per kilowatt capacity	$105	$135	$105	$75
Operating costs:				
Fixed costs (per year)	$525,000	$840,000	$455,000	[3] NA
Variable costs (mills per kilowatt-hour)	2.71	2.86	2.94	[3] NA
Power required (kilowatts)	12,600	20,200	9,000	4,100

[1] 1979 calculations.

[2] 1980 estimates.

[3] Would not exceed Wellman-Lord unless ammonia and/or phosphate costs increased significantly—total operating costs of $53,000,000 were assessed in 1978 dollars.

Comparisons of the capital costs and operating power requirements are shown in Table 1. Estimates done in 1978 by Arthur McKee and Company indicated that with the Pircon Peck process an estimated 620,000 tons per year of 9–30–0 fertilizer would be produced in sulphur abatement activities on a 500mw power plant. Costs were estimated to be $53,000,000 per year and sales of fertilizer were expected to bring in $93,000,000 per year leaving a net operating profit of $40,000,000 per year from sulphur abatement and fertilizer production. At that time capital costs for a 500mw plant were estimated to be $27,000,000.

OTHER BENEFITS

Several other potential benefits might be expected if a high efficiency scrubber with low costs of operation could be used. Washing of coal might be eliminated with such a scrubber in place. Costs of the washing process and concomitant shrinkage could be eliminated. Savings could amount to $1.50 per ton of coal used. Eliminating washing would also reduce many of the problems of moisture in the coal which increase handling costs and increase heat requirements to burn the coal in a burner box. Being able to burn high sulphur coal would simplify mining where high pyrite (high sulphur) content coal is intermingled with other coal. Presently the high pyrite coal must be worked around or set aside, thus increasing mining costs and cutting the coal yield. Savings could range from $2 to $4 per ton depending on the geology.

RETROFITTING

The figures quoted from Arthur McKee and the figures in Table 1 are for new construction. Costs of retrofitting a power plant with a particular process cannot be estimated since there are too many site specific variables to consider. However it can be stated that costs would be higher in all cases. In 1979 reported costs of retrofitting a scrubber averaged about $4 more per kilowatt hour of capacity when compared to new construction. This probably understates the actual cost differential since retrofitting is often only partial.

NON-FERROUS SMELTER APPLICATIONS

In addition to coal burning power plants a consideration should be given to the role of the Pircon Peck process in SO_x abatement at non-ferrous smelters. As earlier EPA data indicate the total possible SO_x from power plants is much higher than from smelters. The real problem is, however, that smelters represent almost the same total of SO_x to be removed from the gases as do power plants. That is, the amount of SO_x generated in the United States beyond the limits set by EPA is almost equally divided between smelter gases and power plant emissions. Thus the potential contribution of the Pircon Peck process to smelter gas clean up is as great for smelters as for power plants.

In fact the Pircon Press process may be even more efficient for smelter gases because of their more concentrated SO_x levels.

However, when smelter gases are considered one does not usually discuss limelimestone absorption of SO_x. Rather the conversion of SO_x to sulfuric acid is of prime concern, i.e., the cost comparison should be with an acid plant. The reason for acid plant preference by the nonferrous smelters (especially for copper ores) is that the acid is a useful ingredient in treating the oxidized ores. However, for reasons of location and/or the type of ore not all smelters can economically justify an acid plant. Furthermore, if predictions for the Intermountain region hold true lower priced acid may be widely available from fossil fuel processors. Nonetheless for purposes of comparison the capital costs for an acid plant and a Pircon Peck reactor producing 9–30–0 fertilizer can be made. Likewise total operating costs can be compared. The data are based on the figures given earlier for production of 620,000 tons of fertilizer per year. The capital costs are most affected by equipment size while operating costs are affected by size and by SO_x levels. Thus, the large gas flow of a power plant with lower SO_x levels generally means a higher capital cost for the same fertilizer production. On the other hand, treating the same amount of gas (equivalent capital costs) could result in higher operating costs for the smelter treatment plant because more ammonia and phosphate would be needed to treat the richer SO_x level of the smelter gases.

TABLE 2

	Acid plant [1]	Pircon-Peck [2]
Capital	$21,600,000	$27,025,000
Operating	4,500,000	53,000,000
Projected annual sales	9,855,000	92,752,000

[1] Based on 92,600 scfm gas flow at 10 percent SO_2 producing 1,350 stpd of H^2SO_4 (98.4 percent); 1979 dollars.

[2] Based on 1,060,000 scfm gas flow at 0.25 percent SO_2 producing 1,705 stpd 9–30–0 fertilizer; 1978 dollars. (Exclusive of costs or sales due to metal recovery via ion-exchange.)

The important point to be noted from Table 2 is that the capital costs for fitting a Pircon Peck reactor to a smelter are likely to be lowered by a factor proportional to the amount of gas to be handled. However, the smelter reactor will be treating over three times as much SO_x as the power plant reactor. That may lead to some increased operating cost if phosphate or ammonia costs are significant. If, on the other hand, operating costs are primarily for utilities, labor, etc., then operating costs may in fact be reduced as the gas volume decreases. Most importantly the exceptionally high value of the product fertilizer relative to the product acid would make the use of a Pircon Peck reactor an attractive investment.

CONCLUSIONS

The Pircon Peck process shows potential of being able to efficiently control flue gas sulphur emissions and produce useful by-products. The advantages of the system are:

1. Efficiency of removal of flue gas sulphur is high when compared to other systems.
2. Energy requirements for operating the process are low.
3. Capital costs of construction are less than for other systems.
4. The process is flexible and can easily be scaled up or down or adjusted for richness of SO_x in the flue gas.
5. Low cost ammonium phosphate fertilizer can be directly produced from flue gas.
6. Strategic metals can be recovered from flue gas.
7. Waste disposal problems are minimal.
8. Lower grades of phosphate rock can be used in fertilizer production; thus utilizing lower grade deposits outside of Florida.
9. A profit can be made from sulphur abatement activities.
10. The process provides economic incentive to use high sulphur coals.
11. Since fertilizer production is directly proportional to the quantity of sulphur captured the plant operation will have incentive to operate the system at SO_2 capture rates in excess of EPA standards.
12. Some steps in washing and sorting of coal might be eliminated.
13. The sulphur captured in fertilizer would be particularly beneficial to forage crop soils in the North Central Region which are often sulphur deficient.
14. When used on a non-ferrous smelter, by-product fertilizer is much more saleable than smelter acid.

THE HETEROGENEOUS REACTOR AND THE PIRCON-PECK PROCESS: THE PROFITABLE ANSWERS TO HIGH SULFUR COAL UTILIZATION

A novel technology has been developed which efficiently and inexpensively eliminates particulate and harmful gaseous emissions from the combustion of high sulfur coal in one simultaneous step. International Ecological Energy Systems, Ltd., owns the exclusive license for its commercialization outside the U.S. and Canada.

This technology is presently the only economical means of permitting the use of coal, regardless of sulfur content, without any adverse ecological affect. In fact, the Reactor, invented by L. J. Pircon, has proven itself as a tool for the efficient treatment of industrial toxic gaseous and chemical wastes. In addition, Research Associates, the operating company for International Ecological Energy Systems, Ltd., has pilot plant and large industrial plant test results of a preceding company. This company was committed to the development of technological and market information in this area.

HETEROGENEOUS REACTOR

The Heterogeneous Reactor is a pollution control device which employs small amounts of water, or can be operated dry, depending on its application. The Heterogeneous Reactor is a vertical, multiple stage tower, similar to a refinery distillation column, which upgraded the refinery operation from trial and error to scientific engineering design parameters and predictability treatment that are used in a refinery distillation column. This column is located between the boiler and the stack when employed for coal burning boiler emission control or between the pollution source and the outlet in the process applications.

HETEROGENEOUS REACTOR'S ADVANTAGES OVER OTHER EQUIPMENT

Traditional pollution abatement control systems consist chiefly of electrostatic precipitators, baghouses, and scrubbers. These technologies have remained stagnant with no significant innovation and only a few refinements of the principles involved. Efforts to improve performance capabilities, in order to meet new air quality standards, have been extremely costly and also ineffective.

The Heterogeneous Reactor was developed to reduce initial capital investment and operating costs. In addition, the technology provides the opportunity for a positive return on investment through various end product recoveries.

After nine years, approximately twenty-four commercial installations have continued to operate with unprecedented success. This performance has been verified by five outside engineering firms. Furthermore, within the last year, the University of Wisconsin has determined that, due to the Reactor's low liquid to gas ratio, a simple ion exchange system could be added in order to recover precious metals. Normally, ion exchange columns become inoperable or uneconomical because of high flooding rates. Now, with the Hetereogeneous Reactor, combined with an ion exchange system, significant amounts of metals can be profitably recovered from the coal for only a small additional investment. These metals include: copper, manganese, boron, zinc, molybdenum, aluminum, titanium, chromium, cobalt, nickel, magnesium, uranium, platenium, and cadmium.

The following page shows the Heterogeneous Reactor's operating cost breakdown for industrial flow rates and provides an analysis of the cost advantages over the other two competing equipment technologies.

PIRCON-PECK PROCESS

To elevate the economics of the burning of high sulfur coal from being inexpensive to becoming profitable, I.E.E.S., Ltd., obtained the license of the Pircon-Peck Process. The profitability results from combining the cost-cutting advantage of the Heterogeneous Reactor with the by-product producing Pircon-Peck Process. The result is a new, more economical use of a phosphate chemistry which produces an ammonium phosphate and nitrate-fertilizer as an end product. A second valuable end product results from the recovery of the metals in the ash. Forty-four precious metals are available, a number of which are critical to the defense of independent nations. The income from these metals can equal that from the fertilizer sales.

The following equipment and equipment operating cost breakdown is intended to provide a general overview of the cost advantages the heterogeneous reactor possesses over the two basic competing technologies.

EQUIPMENT COMPARISONS

[50,000 ft^3/min units]

	Baghouse	Scrubber	Heterogeneous reactor
Initial cost of equipment:			
Particulates	$400, 000	$375, 000	$325, 000
Particulates plus gas absorption		[1] $2, 980, 000	[2] $1, 200, 000
Pressure drop (inches of water):			
Particulates	8	40	3
Particulates plus gas absorption		60	7
Liquid to gas ratio (gallons per 1,000 ft^3):			
Particulates		40	1
Particulates plus gas absorption		90	2
Fan brake house power:			
Particulates	105	480	50
Particulates plus gas absorption		720	105
Annual energy consumption (megawatt hours):			
Particulates	583	2, 265	278
Particulates plus gas absorption		3, 398	583
Annual energy costs: [3]	$27, 984	$108, 720	$13, 344
Particulates plus gas absorption		$163, 104	$27, 984
Efficiencies (percent):			
Particulate	99	97	99
Particulate plus gas absorption		85	95

[1] Power Engineering, March 1978, p. 56. (Installed cost corrected for inflation.)
[2] Adjusted to installed cost. (Analysis indicated installation cost equalled equipment sales price—nonsite specific.)
[3] $48 per megawatt hour employed.

PIRCON-PECK PROCESS ADVANTAGES OVER COMPETING PROCESSES

Experience with conventional flue gas desulfurization systems show them to be unreliable. They need frequent repair and the "downtime" is significant, hence, costly to operate. The Pircon-Peck Process offers the advantage of being capable of removing particulates and sulfur oxides simultaneously. The pilot equipment, tested at the Illinois Institute of Technology, operated over a wide range of conditions, including "cool downs" and "cold" starts without plugging of the units, tanks or lines, consequently, reducing maintenance costs and "downtime." Furthermore, the small size of the required auxiliary equipment because of the low amount of liquid needed, makes the entire system less costly. More importantly, the Pircon-Peck Process removes both sulfur dioxides and nitrogen oxides and then converts them to saleable ammoniated phosphate and nitrate fertilizers. Therefore, the higher the sulfur content of the coal, the more saleable fertilizer is produced. Here, again, with the addition of an ion exchange system, significant amounts of precious metals can be recovered. In other words, the Pircon-Peck Process could be more aptly described as a profitable resource recovery system.

The following Table highlights the comparative economic advantages of the Pircon-Peck Process over conventional systems.

COST ADVANTAGES OVER COMPETITIVE DESULFURIZATION PROCESSES AND PROFIT POTENTIAL (500) MEGAWATTS

	Cost avoidance advantages	Amount of savings
Initial capital investment	60 MM [1]—40 MM [2]	$20, 000, 000
Reduction of	1/60 of fan power	7, 701, 700
Power requirement	1/90 of pump power	
Elimination of lime purchase	$42 per ton	16, 215, 600
Elimination of need for coal washing	$1.50 per ton	6, 254, 600
No coal waster, sludge treatment or handling	$0.80 per ton	2, 350, 700
Elimination of selective mining	$2 per ton	4, 467, 600
Total, cost reduction		37, 990, 200
Revenues from fertilizer production	$38 per ton, 9–30–0	28, 500, 000
Revenues from precious metals recovery	$112 per ton micronutrient frit	19, 264, 300
Total, potential revenues		47, 764, 300
Total, annual cost advantage of Pircon-Peck process.		85, 754, 500

[1] Competitive system.
[2] Pircon-Peck process.

ECONOMIC ADVANTAGES OF BURNING HIGH SULFUR COAL VERSUS LOW SULFUR COAL WHEN UTILIZING PIRCON-PECK PROCESS

High sulfur contains 22.11 x 10^6 BTU's per ton. Low sulfur coal contains 18.65 x 10^6 BTU's per ton. Based on a 500 megawatt power plant requiring 2.2 million tons of high sulfur coal per year or 2.6 million tons of low sulfur coal per year, the following cost comparison can be made:

	High sulfur	Low sulfur
Price per ton	$28.35	$32.24
Total annual coal costs	62,000,000.00	84,000,000.00

The potential savings to a utility when utilizing high sulfur coal in conjunction with the Pircon-Peak is approximately $22,000,000 per year.

Furthermore, increased sulfur content forces the operating costs of a standard scrubber to increase due to a greater need for neutralizing chemicals. Sludge disposal costs also incease dramatically. With Pircon-Peck Process, as the sulfur content increases, there is a proportional increase in fertilizer production. Therefore, high-sulfur coal would increase profits but not operating costs. The process is also much easier to control and does not have the temperature and Ph sensitivity problems of other processes.

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